Fachverband Extraterrestrische Physik (EP) und Arbeitsgemeinschaft Extraterrestrische Forschung (AEF) e.V. gemeinsam mit der Astronomischen Gesellschaft e.V.

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Fachübergreifende Veranstaltungen unter Beteiligung der Extraterrestrischen Physik

Plenarvorträge

PV I	Mo	11:30–12:15	HG X und HG Aula	**From Disks to Planets: The Formation of Planetary Systems** — •Thomas Henning
PV V	Mi	12:10–12:50	Oper	**Dark Matters** — •Simon White
PV VIII	Do	11:45–12:30	HG X und HG Aula	**Hochenergiekosmos: Experimente, Ergebnisse, Perspektiven** — •Karl-Heinz Kampert
PV IX	Fr	11:00–11:45	HG X und HG Aula	**Going to extremes: Fundamental physics and radio astronomy** — •Michael Kramer
PV X	Fr	11:45–12:30	HG X und HG Aula	**What is wrong with the Sun? The Present and Future of Solar Physics** — •Sami K. Solanki

Symposium Black Holes (SYBH)

SYBH 1.1	Mo	13:15–13:50	HG Aula	**From the Geometry of Spacetime to the Geometry of Numbers** — •Stefan Hollands
SYBH 1.2	Mo	13:50–14:25	HG Aula	**Black Holes in Four and Higher Dimensions** — •Jutta Kunz
SYBH 1.3	Mo	14:25–15:00	HG Aula	**Philosophical Aspects of Black Holes** — •Chris Smeenk
SYBH 1.4	Mo	15:20–15:55	HG Aula	**Super-Massive Black Holes at the Centers of Galaxies: The Case of Sagittarius A* at the Center of the Milky Way** — •Andreas Eckart
SYBH 1.5	Mo	15:55–16:30	HG Aula	**Classical and Relativistic Dynamics of Supermassive Black Holes and their Spin in Galactic Nuclei** — •Rainer Spurzem

Symposium Extrasolare Welten (SYEW)

SYEW 1.1	Mi	16:45–17:15	HG I	**Extrasolar Planets** — •Artie Hatzes
SYEW 1.2	Mi	17:15–17:45	HG I	**Gravitational Microlensing: A powerful method for the detection of extrasolar planets** — •Joachim Wambsganss
SYEW 1.3	Mi	17:45–18:15	HG I	**The Formation of Planets** — •Wilhelm Kley
SYEW 1.4	Mi	18:15–18:45	HG I	**Von der Habitabilität zur Entstehung und Evolution des Lebens** — Gerda Horneck, •Petra Rettberg

Hauptvorträge und Fachsitzungen

(Hörsaal AKM)

Die Sitzungen des Fachverbands EP finden im Akademischen Kunstmuseum, Am Hofgarten 21, 53113 Bonn statt. Ein Lageplan befindet sich am Ende des Hefts.

Hauptvorträge

EP 1.1	Mo	9:00– 9:30	AKM	**Highlights of the CAWSES priority program in Germany** — •Franz-Josef Lübken
EP 1.4	Mo	10:00–10:30	AKM	**Das neue Bild der ionosphärisch-thermosphärischen Wechselwirkungen, Ergebnisse von CHAMP, Erwartungen an Swarm** — •Hermann Lühr
EP 4.1	Di	8:30– 9:00	AKM	**Observations of the Global Interaction between the Heliosphere and its Galactic Environment: Results from the Interstellar Boundary Explorer (IBEX)** — •Horst Fichtner, Hans Fahr
EP 5.1	Di	9:45–10:15	AKM	**Marie Curie Actions in the 7th Framework Programme (FP7)** — •Martin Lange
EP 5.2	Di	10:15–10:45	AKM	**Das Cosmic Vision 2015-2025-Programm der ESA - Status und nächste Schritte** — •Wolfgang Frings, Eberhard Bachem
EP 9.1	Mi	8:30– 9:00	AKM	**Frisch gezapft: Die Zusammensetzung der Eisteilchen in den Eisfontänen des Enceladus** — •Frank Postberg, Sascha Kempf, Jürgen Schmidt, Jon Hillier, Ralf Srama
EP 10.1	Mi	13:45–14:15	AKM	**Vielfältige Winde in der Atmosphäre des Saturnmondes Titan** — •Tetsuya Tokano
EP 12.1	Do	8:30– 9:00	AKM	**Herschel, a new Window to the Infrared Universe** — Franz Kerschbaum, •Roland Ottensamer
EP 16.1	Fr	8:30– 9:00	AKM	**Solar Dynamics Observatory (SDO)** — •Markus Roth

Hauptvorträge zu fundamentalen Weltraumexperimenten (gemeinsam mit GR)

GR 5.1	Di	8:30– 9:10	JUR K	**Orbitalsysteme als Plattformen für grundlegende physikalische Experimente** — •Hansjörg Dittus
GR 5.2	Di	9:10– 9:50	JUR K	**LISA and LISA Pathfinder: Gravitational wave astronomy from space** — •Karsten Danzmann
GR 5.3	Di	9:50–10:30	JUR K	**Towards a One Percent Measurement of Frame Dragging by Spin with Satellite Laser Ranging to LAGEOS, LAGEOS 2 and LARES and GRACE Gravity Models** — •Ignazio Ciufolini, Antonio Paolozzi, Erricos Pavlis, John Ries, Rolf Koenig, Richard Matzner, Giampiero Sindoni, Hans Neumayer

Fachsitzungen

EP 1.1–1.6	Mo	9:00–11:00	AKM	**Near Earth Space I**
EP 2.1–2.4	Mo	16:45–17:45	AKM	**Near Earth Space II**
EP 3.1–3.35	Mo	17:45–19:00	AKM Foyer	**Poster**
EP 4.1–4.4	Di	8:30– 9:45	AKM	**Heliosphere I**
EP 5.1–5.2	Di	9:45–10:45	AKM	**Programmatics**
EP 6.1–6.4	Di	14:00–15:00	AKM	**Heliosphere II**
EP 7.1–7.5	Di	15:00–16:15	AKM	**Fundamental Physics**
EP 8.1–8.9	Di	16:45–19:00	AKM	**Planets and Small Bodies I**
EP 9.1–9.6	Mi	8:30–10:15	AKM	**Planets and Small Bodies II**
EP 10.1–10.4	Mi	13:45–15:00	AKM	**Planets and Small Bodies III**
EP 11.1–11.6	Mi	15:15–16:45	AKM	**Exoplanets**
EP 12.1–12.7	Do	8:30–10:30	AKM	**Astrophysics I**
EP 13.1–13.9	Do	14:00–16:15	AKM	**Astrophysics II**
EP 14.1–14.1	Do	16:45–17:00	AKM	**Astrophysics III**
EP 15.1–15.3	Do	17:00–17:45	AKM	**Sun I**
EP 16.1–16.7	Fr	8:30–10:30	AKM	**Sun II**

Poster

Die Postersitzung des Fachverbands EP und der AEF e. V. findet am Montag, 17:45–19:00 Uhr, im Foyer des AKM (Akademisches Kunstmuseum, Am Hofgarten 21, 53113 Bonn) statt. Für das leibliche Wohl wird gesorgt.

Begrüßungsabend

Am Montag, 19:30 Uhr, findet ein Begrüßungsabend mit Imbiss und Getränken in der Mensa der Universität, Endenicher Allee 17, statt.

Mitgliederversammlung des Fachverbands Extraterrestrische Physik und der AEF e.V.

Dienstag 12:30–14:00 AKM (Akademisches Kunstmuseum, Am Hofgarten 21, 53113 Bonn)

Der Vorstand des FV EP und der AEF e. V. lädt herzlich ein zur Mitgliederversammlung 2010.

Tagesordnung:

- Begrüßung
- Feststellung der Beschlussfähigkeit
- Genehmigung des Protokolls der Mitgliederversammlung 2009
- Bericht des Vorstandes
- Bericht des Schatzmeisters
- Entlastung des Vorstandes
- Abschlussbericht Internationales Jahr der Astronomie 2009
- Neue Kommissionsstruktur und Zusammenarbeit mit anderen Verbänden
- Geschichte des Fachverbands und der AEF
- Nationale Raumfahrtstrategie
- Denkschrift Sonnensystemforschung
- Höhepunkte und Veranstaltungen 2010-11-12
- Entwicklung des Journals ASTRA
- Sonstiges

Für das leibliche Wohl wird gesorgt.

EP 1: Near Earth Space I

Zeit: Montag 9:00–11:00 Raum: AKM

Hauptvortrag EP 1.1 Mo 9:00 AKM

Highlights of the CAWSES priority program in Germany — •Franz-Josef Lübken — Leibniz Institute for Atmospheric Physics, 18225 Kühlungsborn, Germany

The German Science Foundation (Deutsche Forschungsgemeinschaft, DFG) has created a priority program for the period 2005-2011 closely linked to the international CAWSES project of SCOSTEP. The aim is a better understanding of the influence of the Sun on the terrestrial atmosphere on time scales from hours to centuries. The focus is on absorption of solar radiation and particles, the generation and modification of photochemically active trace gases, and the generation of waves, including tides. Topics being investigated include: 1. characterisation of solar forcing by electromagnetic radiation and by particle impact, 2. analysis of solar forcing impact on the thermal, dynamical, electro-dynamical, and compositional structure of the atmosphere from the upper troposphere to the lower thermosphere and on time scales from hours to centuries, 3. investigation of the coupling mechanisms in the atmosphere, including transport of trace gases, and the morphology of waves, 4. understanding of solar signals in atmospheric parameters which are not directly influenced by the Sun, including a study of the relevant physical and photochemical processes, 5. comparison of solar induced long term variations with anthropogenic climate change, 6. relevant laboratory studies. Approximately 80-100 scientists at 25 research institutes in Germany are involved in this program. Some scientific highlights of phase I and II of this program will be presented.

EP 1.2 Mo 9:30 AKM

Thermosphärische Wind- und Dichtestörungen durch magnetische Teilstürme — Patricia Ritter[1], Hermann Lühr[1] und •Eelco Doornbos[2] — [1]Deutsches GeoForschungsZentrum - GFZ, Potsdam — [2]TU Delft, Dept. of Earth Observation and Space Systems (DEOS), The Netherlands

Der Energie- und Impulseintrag aus der Magnetosphäre in die Ionosphäre bzw. Thermosphäre findet vorwiegend in hohen Breiten statt. Die vorliegende Studie befasst sich mit dem Phänomen der magnetischen Teilstürme und den damit verbundenen Beobachtungen in der Thermosphäre durch den Satelliten CHAMP. Aus den Messungen des sehr empfindlichen Akzellerometers an Bord des Satelliten können die Luftdichte und zonalen Winde abgeleitet werden. Basierend auf einer großen Anzahl von Teilstürmen konnten wir die typische Reaktion der Thermosphäre in hohen und niedrigen Breiten ermitteln. Nach Einsetzen eines Teilsturms ist die thermosphärische Luftdichte zunächst in den Polargebieten erhöht. Diese Dichteanomalie bewegt sich auf der Nachtseite mit einer Geschwindigkeit von 650 m/s hin zu niedrigen Breiten und erreicht 3-4 Stunden später den Äquator. Durch den Einfluss der Corioliskraft wird diese wandernde atmosphärische Störung (TAD) westwärts abgelenkt. In Übereinstimmung mit neueren Windmodellen ist die Änderung der zonalen Windgeschwindigkeit, die mit dieser Störung einhergeht, in der Nähe des Äquators kurz vor 24 Uhr sehr gering und erreicht dort nach Mitternacht moderate, westwärtsgerichtete Geschwindigkeiten. Generell ist das Windsystem der Thermosphäre durch magnetische Teilstürme wenig gestört.

EP 1.3 Mo 9:45 AKM

Prediction of GCR proton intensities from simultaneous proton and electron measurements during an A<0 solar minimum — •B. Heber[1], J. Gieseler[1], K. Herbst[1], A. Kopp[1], R. Müller-Mellin[1], H. Fichtner[2], K. Scherrer[2], F. Steinhilber[3], M. Potgieter[4], and S. Ferreira[4] — [1]IIEAP, CAU, Kiel — [2]TP-4, RUB — [3]Eawag, Dübendorf, CH — [4]NWU, Potchefstroom, SA

The intensity of GCRs is modulated as they traverse the turbulent heliospheric magnetic field (HMF) embedded in the solar wind. To describe this modulation the so called force-field approximation is often used. This handy approximation depends on two quantities only: the modulation parameter Φ and the local interstellar spectrum outside the heliosphere. However, the modulation parameter Φ can not take into account the differences between positive and negative solar magnetic epochs or the difference over the Hale cycle. Although the HMF strength in the current solar minimum is the lowest observed since the 1960's, the intensity as measured by neutron monitors (NMs, mid 2009) is about the same as in the 1960's. While the 2.5 GV KET proton measurements confirm the NM measurements, 2.5 GV GCR electrons exceed the intensity of protons by more than 30%. Using Φ from Usoskin et al. (2005) the proton time profile could be reproduced reasonably well from 1990 to 2004, spanning values from $\Phi = 400$ MV in 1997 and $\Phi = 1100$ MV at solar maximum. The latest KET proton measurements result in a modulation potential of about $\Phi = 350$ MV. Since electrons and protons at these rigidities have the same modulation amplitude, Φ is expected to decrease to 290 MV.

Hauptvortrag EP 1.4 Mo 10:00 AKM

Das neue Bild der ionosphärisch-thermosphärischen Wechselwirkungen, Ergebnisse von CHAMP, Erwartungen an Swarm — •Hermann Lühr — Deutsches GeoForschungsZentrum - GFZ, Potsdam

Der Satellit CHAMP hat während seiner nahezu 10 jährigen Mission eine Menge neuer Erkenntnisse speziell über die Thermosphäre hervorgebracht. Mit seiner nahezu polaren Bahn in etwa 400 km Höhe deckt er alle Breiten ab. Es hat sich gezeigt, dass die Neutralgasdynamik der Hochatmosphäre stärker als vermutet von der Geometrie des Magnetfeldes beeinflusst wird. Sowohl die Dichte als auch der Wind weisen deutliche Strukturen auf, die dem magnetischen Äquator folgen. Keine dieser Eigenschaften hat bisher Eingang in die gängigen atmosphärischen Modelle gefunden. Aber auch umgekehrt beeinflusst der neutrale Wind die Plasmadynamik und führt zu speziellen Stromsystemen in der ionsphärischen F-Schicht.

Diese aus der CHAMP Mission resultierenden Ergebnisse geben eine gute Vorlage für die bevorstehende Swarm Mission. Swarm ist eine ESA Erdbeobachtungs-Mission, die drei CHAMP-ähnliche Satelliten umfasst. Der vorgesehene Formationsflug bietet die Möglichkeit, räumliche und zeitliche Variationen besser zu trennen. Der Start der Satelliten ist für Mitte 2011 vorgesehen.

EP 1.5 Mo 10:30 AKM

Die Mesosphäre: Ein Frühwarnsystem für Klimaänderungen? — •Uwe Berger und Franf-Josef Lübken — Leibniz Institut für Atmosphärenphysik, Kühlungsborn

Der Bereich der Mesosphäre von 50 km bis 70 km kann als der empfindlichste Teil der gesamten Atmosphäre für Klimaänderungen angesehen werden. Nach heutigem Kenntnisstand kann ein Abkühlungstrend von 3-5 K/Dekade in niederen und mittleren Breiten nachgewiesen werden. Dieser starke Trend in der oberen Atmosphäre setzt sich aber zu hohen und polaren Breiten aber anscheinend nicht fort.

Indikatoren für die dortigen Temperaturen sind nachtleuchtende Wolken (NLC), die aus sehr kleinen Eisteilchen bestehen. Schon sehr kleine Änderungen der Temperatur bzw. des Wasserdampfgehaltes wirken sich stark auf Höhe und Helligkeit der NLC aus. Variationen von Häufigkeit, Höhe und Helligkeit der Wolken lassen möglicherweise Rückschlüsse auf klimatische Veränderungen zu. Dazu sind allerdings umfangreiche Zeitreihen notwendig. Die bisher längsten Messungen bestehen aus visuellen Beobachtungen der Häufigkeit von NLC und umfassen ca. 40 Jahre. Von Satelliten aus werden Messungen der Häufigkeit und Helligkeit seit ca. 30 Jahren durchgeführt. Beide Messreihen zeigen 1) Variationen mit Perioden zur Sonnenaktivität und 2) eine generelle Zunahme in den letzten Dekaden, also einen Klimatrend.

Unterliegt nun also doch auch die polare Mesopausenregion (80-90 km) einem Klimawechsel? Diese Fragestellung soll anhand von Modell- und Beobachtungsdaten untersucht werden.

EP 1.6 Mo 10:45 AKM

Measurements of mesospheric ice aerosols using radars and rockets — •Irina Strelnikova, Qiang Li, Boris Strelnikov, and Markus Rapp — Leibniz Institute of Atmospheric Physics, Schloss-Str. 6, 18225 Kuhlungsborn, Germany

Polar summer mesopause is the coldest region of Earth's atmosphere with temperatures as low as minus 130° C. In this extreme environment ice aerosol layers have appeared. Larger aerosols can be seen from the ground as clouds known as NLC (Noctilucent clouds). Ice aerosols from sub-visible range give rise to the phenomena known as Polar Mesosphere Sommer Echo (PMSE). For efficient scattering, electron number density must be structured at the radar half wavelength (Bragg condition). The general requirement to allow for the observation of structures at VHF and higher frequencies is that the dust size (and charge number) must be large enough to extend the convective-

diffusive subrange of the energy spectrum of electrons (by reducing their diffusivity) to the wavelength which is shorter than the Bragg-scale of the probing radar. In this paper we present main results of ice particles measurements inside the PMSE layers obtained from in situ rocket soundings and newly developed radar techniques.

EP 2: Near Earth Space II

Zeit: Montag 16:45–17:45 Raum: AKM

EP 2.1 Mo 16:45 AKM

Analyse der spektralen Form polarer mesosphärischer Winterechos gemessen mit dem EISCAT-VHF-Radar — •Norbert Engler, Markus Rapp und Irina Strelnikova — Leibniz-Institut für Atmosphärenphysik an der Universität Rostock, Schlossstr. 6, 18225 Kühlungsborn

Mit Radaruntersuchungen können Eigenschaften und Dynamik der Atmosphäre untersucht werden. Mit VHF-Radars können während des polare Winters Echos in der Mesosphäre (60 – 80 km) beobachtet werden, die unter bestimmten Vorraussetzungen auftreten. Entscheidend für das Auftreten dieser Echos ist eine ausreichend hohe Volumenreflektivität, die abhängig von der Ionisation und der Turbulenzstärke ist. Mit dem EISCAT VHF-Radar (224 MHz) wurden Messungen in dem interessierenden Höhenbereich durchgeführt. Die spektrale Form dieser Echos gibt Aufschluss über den Streumechanismus und somit über die für die Rückstreuung verantwortlichen Strukturen. Eine Analyse der gemessenen Spektren bezüglich der Signalstärke, der der spektralen Breite und der Form sowie deren Höhenverteilung lassen Rückschlüsse auf den vorliegenden Streumechanismus zu.

EP 2.2 Mo 17:00 AKM

A new MST-Radar in Northern Norway: Motivation, system description and observation strategies — •Gunter Stober, Ralph Latteck, Werner Singer, Toralf Renkwitz, Marius Zecha, Norbert Engler, and Markus Rapp — Leibniz-Institute of Atmospheric Physics at the University of Rostock, Schlossstr. 6, 18225 Kühlungsborn

Currently the Leibniz-Institute of Atmospheric Physics is building a new MST- Radar at the Andoya Rocket Range in northern Norway. The new radar represents a benchmark in the development of modern VHF radars (51.3 MHz) to investigate with a high vertical and horizontal resolution atmospheric structures from the Troposphere to the Mesosphere Lower Thermosphere Region. The system consists of 433 Yagi antennas, which are each connected to its own transceiver. Each transceiver will deliver a peak power of 2kW, which results in a total peak power of approximately 800kW for the complete aperture. The radar is freely steerable from pulse to pulse within a zenith angle $<30°$ and is therefore suitable to perform horizontal scans of reflectivity or to resolve the horizontal wind field. The system can be set up to a large variety of experiments such as Doppler Beam Swinging, Full Correlation Analysis, Frequency Domain Interferometry, Range Imaging Interferometry, Range Imaging with multiple frequencies, Meteor head echoes, Meteor specular observations and different vertical and horizontal scanning experiments.

EP 2.3 Mo 17:15 AKM

Skaleninvariante Diffusion in der MLT in einem globalen Zirkulationsmodell (GCM) — •Urs Schaefer-Rolffs und Erich Becker — Leibniz-Institut für Atmosphärenphysik an der Universität Rostock, D-18225 Kühlungsborn,

Um die Dynamik der Mesosphäre und unteren Thermosphäre (MLT) zu verstehen, ist man auf GCMs der Atmosphäre angewiesen. Diese haben allgemein das Problem, dass sich bedingt durch eine begrenzte Auflösung kinetische Energie und Enstrophie bei den kleinsten aufgelösten Skalen ansammeln, sofern keine Hyperdiffusion angenommen wird. Bei physikalisch korrekter Beschreibung muss diese Energie mittels turbulenter Dissipation transformiert werden, welches u.a. durch Diffusion zu nicht aufgelösten Skalen beschrieben wird. Im klimatologischen Mittel muss die Dissipation genau der adiabatischen Umwandlung von verfügbarer potentieller Energie zu kinetischer Energie entsprechen. Das Kühlungborn Mechanistic GCM (KMCM) reicht bis 120 km Höhe und vermag bei hohen Auflösungen Schwerewellen bis zur Mesopausenregion aufzulösen. Da einerseits die Dämpfung dieser Wellen einen wesentlichen Antrieb der atmosphärischen Dynamik in dieser Höhe darstellt und andererseits Diffusion zur Dämpfung der Wellen notwendig ist, muss die Diffusion bis zur Thermosphäre möglichst genau beschrieben werden. In meinem Vortrag werde ich bisherige Ansätze der Horizontaldiffusion skizzieren und eine verbesserte Parametrisierung der Horizontaldiffusion für das KMCM vorstellen. Diese zeichnet sich u.a. dadurch aus, dass das Problem der fehlenden Skaleninvarianz bisheriger Diffusionsschemata umgangen wird.

EP 2.4 Mo 17:30 AKM

A Simplified Radiative Transfer Scheme for Use in Mechanistic GCMs — •Rahel Knöpfel and Erich Becker — Leibniz-Institute of Atmospheric Physics, Kühlungsborn, Germany

In the mesosphere and lower thermosphere, radiative damping is an important damping mechanism for gravity waves. The full nonlinearity of this process can only be investigated in high-resolution simulations. This task cannot be achieved with comprehensive general circulation models (GCMs). In the present study, a new radiation scheme which extends continuously from the surface up to the thermosphere is proposed. In the long-wave regime, frequency-averaged Eddington-type transfer equations are derived for six broad absorber bands. The frequency variation inside each band is parameterized by application of the Elsasser band model, yielding additional transfer equations for the perturbation amplitudes. Deviations from local thermodynamic equilibrium are included in terms of isotropic scattering using the two-level model for each band. The absorption of solar radiation is computed for four energetically defined bands from the Beer-Bougert-Lambert relation. Test simulations with a mechanistic GCM run at conventional resolution show quite reasonable results. Since we take the full surface heat budget into account by means of a swamp ocean, and since the internal dynamics and turbulent diffusion of the model is formulated in accordance with the conservation laws, the climatological radiation budget is globally equilibrated. In the future, this model will be applied in gravity-wave resolving simulations.

EP 3: Poster

Zeit: Montag 17:45–19:00 Raum: AKM Foyer

EP 3.1 Mo 17:45 AKM Foyer

In-situ exploration of plaetary atmospheres with balloons — •Michael Danielides[1], Jaime Esper[2], Georg Herdrich[3], Klaus Bayler[1], and Hannes Griebel[1] — [1]Mars Society Germany — [2]NASA Goddard Space Flight Center, USA — [3]Institute of Space Systems, University of Stuttgart, Germany

Balloon missions have been used extensively on Earth to study a large variety of atmospheric characteristics and phenomena. Of primary interest are in situ temperature, pressure and density profiles and wind velocities. The first planetary balloons were flown in the mid 1980s with the Vega 1 and 2 missions to Venus. Since then, balloons have been further planed for Mars and Titan. The aim of this presentation is to provide a brief overview of the current state in scientific ballooning, and in particular show existing data obtained through the MIRIAM (Main Inflated Re-entry Into the Atmosphere Mission Test) Mars balloon near space deployment experiments. The test ballute MIRIAM was flown on board a REXUS 4 sounding rocket from ESRANGE in northern Sweden on October 22nd, 2008. The balloon was deployed at about 140 km altitude. On board were optical instruments, magne-

tometers, temperature sensors and barometers for atmospheric studies. The data gathered during decent was used to validate inflation and deployment concepts, planetary balloon technologies. The new ballute probe MIRIAM-2 is under construction. It will record atmospheric parameters which will be then compared to Earth upper atmospheric models. Finally, future prospects for balloon use on Mars and Titan will be addressed and discussed.

EP 3.2 Mo 17:45 AKM Foyer

Space weather application center Ionosphere (SWACI) - a common data base for scientific research — N. Jakowski, C. Mayer, K.D. Missling, H. Barkmann, C. Becker, C. Borries, H. Maass, T. Noack, M. Tegler, V. Wilken, and •M. Danielides — German Aerospace Center (DLR), D-17235 Neustrelitz, Germany

The Space Weather Application Center Ionosphere (SWACI) is a joint project of the Institute of Communications and Navigation (IKN) and the German Remote Data Center (DFD) of the German Aerospace Center, essentially supported by the State Government of Mecklenburg-Vorpommern. SWACI (http://swaciweb.dlr.de) operates a powerful data processing system working both in real-time and post-processing modes. Typical data products include European maps of the Total Electron Content (TEC) and corresponding derivatives, updated every 5 minutes. Space based retrievals include radio occultation data as well as a 3D reconstruction of the topside ionosphere. Furthermore, the equivalent slab thickness over the ionosonde station Juliusruh/Germany is offered, updated every 15 min. In addition to the processing of GNSS data, also beacon measurements from various satellites such as NIMS and COSMIC are received and analysed. Although the SWACI service will be fully operational by the end of 2010, SWACI is already available for interested users at a service level reached so far.

EP 3.3 Mo 17:45 AKM Foyer

On the definition and calculation of a generalised McIlwain parameter — •Andreas Kopp[1], Julia Pilchowski[2], Klaudia Herbst[1], and Bernd Heber[1] — [1]IEAP, Christian-Albrechts-Universität zu Kiel, 24118 Kiel — [2]Geophysical Institute, University of Alaska, 903 Koyukuk Drive, 99775-7320 Fairbanks, USA

The L parameter, which indicates the distance where a magnetic field line crosses the equatorial plane, is defined only for an aligned magnetic dipole field. For a realistic planetary magnetic field, however, neither a definition nor a method to calculate this parameter are available so far. We therefore, extent the definition of the McIlwain parameter for an arbitrary planetary magnetic field and numerically calculate it for the actual geomagnetic field. In order to do so, we first calculate the Earth's magnetic field for 2008 with the IGRF model. To motivate a proper definition for a general L parameter, each component of this field will be illustrated and discussed. In second step, we present four possible definitions for the L parameter and discuss their properties and differences with respect to the question in how far they reflect the field geometry. We contrast our method with the traditional derivation of the L parameter employing numerical simulations of the cut-off rigidities of energetic particles and an empirical relation between the latter and L.

EP 3.4 Mo 17:45 AKM Foyer

^{10}Be Production Calculations in the Atmosphere — •Klaudia Herbst[1], Daniel Matthiä[2], Friedhelm Steinhilber[3], and Bernd Heber[1] — [1]IEAP, Christian-Albrechts-Universität zu Kiel, Kiel, Germany — [2]Institut für Luft- und Raumfahrtmedizin, Deutsches Zentrum für Luft- und Raumfahrt, Köln, Germany — [3]Swiss Federal Institute of Aquatic Science and Technology, Ewag, Dübendorf, Switzerland

Cosmic Rays (CRs) interacting with the Earth's atmosphere produce a cascade of secondary particles and cosmogenic nuclides. Cosmogenic nuclides itself are stored in natural archives such as ice cores and can therefore be measured by e.g. accelerator mass spectrometry (AMS). Here we present our calculations of the cosmogenic radionuclide ^{10}Be, which is produced by spallation reactions between secondary neutrons and protons and the atmospheric gases nitrogen and oxygen, using PLANETOCOSMICS, a GEANT4 based computer code (Desorgher [2006]).

EP 3.5 Mo 17:45 AKM Foyer

On the importance of the Local Interstellar Spectrum for the Solar Modulation Parameter — •Klaudia Herbst[1], Andreas Kopp[1], Bernd Heber[1], Friedhelm Steinhilber[2], Horst Fichtner[3], Klaus Scherer[3], and Daniel Matthiä[4,1] — [1]IEAP, Christian-Albrechts-Universität zu Kiel, Kiel, Germany — [2]Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland — [3]Theoretische Physik IV, Ruhr-Universität Bochum, Bochum, Germany — [4]Institut für Luft- und Raumfahrzmedizin, Deutsches Zentrum für Luft- und Raumfahrt, Köln, Germany

We compare several local interstellar proton spectra often used in literature. We show that the modulation parameter ϕ, which parametrizes the modulation of the local interstellar spectrum (LIS) in the heliosphere, strongly depends on the LIS itself. Taking the LIS dependency of the modulation parameter into account, we derive linear equations to convert ϕ between the different LIS. The conversions used are afterwards applied to a long-term reconstruction of ϕ derived from a record of the cosmogenic radionuclide, ^{10}Be. For some LIS models occasionally negative ϕ values are obtained, a fact which is impossible from the physical point of view. Despite non-heliospheric effects such as uncertainties in the geomagnetic field and climate influences on the ^{10}Be production, one possible reason may also be the choice of the LIS. We show that the reconstruction of ϕ provides the potential to derive the lower intensity limit of the LIS, keeping in mind that first the non-heliospheric effects have to be removed from the data.

EP 3.6 Mo 17:45 AKM Foyer

EISCAT-CAWSES-Copernicus Consortium to support German EISCAT user groups — •Norbert Engler[1], Jürgen Röttger[2], and Renate Scherer[3] — [1]Leibniz-Institut für Atmosphärenphysik an der Universität Rostock, Schlossstr. 6, 18225 Kühlungsborn — [2]MPI für Sonnensystemphysik, Max-Planck-Str. 1, 37191 Katlenburg-Lindau — [3]Copernicus Gesellschaft, Bahnhofsallee 1e, 37081 Göttingen

In the framework of the CAWSES priority program funded by the German Research Foundation (DFG) the German contribution to the European Incoherent Scatter Radar (EISCAT) is provided. Several research groups are actively using the possibility to obtain data from the EISCAT experiments. Current activities of German EISCAT users and future perspectives are presented to the community. Science and technical support will be introduced to provide successful usage of the available measurements and the results.

EP 3.7 Mo 17:45 AKM Foyer

Absorption von Radiowellen in der Venusatmosphäre — •Janusz Oschlisniok[1], Martin Pätzold[1], Bernd Häusler[2], Silvia Tellmann[1], Thomas Andert[2], Riccardo Mattei[2] und Christopher Krüger[2] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Universität zu Köln — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München, Neubiberg

Ein Radiosignal wird auf dem Weg von der Raumsonde zur Bodenstation auf der Erde durch unterschiedliche Faktoren abgeschwächt, wovon die Strahlaufweitung (Defocusig) des Signals aufgrund unterschiedlicher Dichte in unterschiedlichen Höhen und die Absorption des Signals durch das atmosphärische Gasgemisch zu den wichtigsten zählen. Frühere Beobachtungen am Planeten Venus zeigten, dass die größte Abschwächung von Radiowellen im Mikrowellenbereich in der Atmosphäre direkt unterhalb der Wolkenregion zwischen ca. 35 und 50 km Höhe stattfindet. Aus der Intensität der aufgezeichneten Signalstärke in der Bodenstation lassen sich Aussagen über die Dämpfung des Radiosignals in der Atmosphäre des Planeten machen und somit Absorptionsprofile ableiten. Das Radio Science Experiment VeRa an Bord der Sonde Venus Express, welche sich seit 2003 im Orbit der Venus befindet wird unter anderem dazu benutzt, die Atmosphäre des Planeten mit Radiowellen zu sondieren. Die mehr als 250 bisher gemessenen vertikalen Profile aus der Atmosphäre haben eine Verteilung über alle planetaren Breiten über unterschiedliche Lokalzeiten. Diese Präsentation zeigt die mittels VeRa erhaltenen Absorptionsprofile.

EP 3.8 Mo 17:45 AKM Foyer

Analysation of the influence of water and higher atmospheric pressure levels on the Martian radiation environment - implications for Martian habitability in the Noachian era — •Bent Ehresmann, Robert F. Wimmer-Schweingruber, Sönke Burmeister, Jan Köhler, Onno Kortmann, and Thomas Möller — IEAP, Christian-Albrechts-Universität zu Kiel

In comparison to Earth, the low atmospheric pressure on today's Mars provides only very weak shielding of the Martian surface against cosmic radiation and allows galactic cosmic rays to propagate all the way to the ground to interact with the soil. Hence, the radiation environment

on Mars is more hazardous for life than on Earth.

To this date, the exact environmental conditions on Mars during the Noachian are still unknown. However, it is widely agreed upon that liquid water existed on the surface at least sporadically during this time span and that Mars possessed a significantly higher atmospheric pressure level which would in all likelihood have resulted in a less hostile surface radiation environment for the possible emergence and evolution of life.

Using Planetocosmics, we calculate particle radiation in the Martian atmosphere and at ground level for different atmospheric and environmental conditions. Here, we present radiation environments for different atmospheric pressure levels, as well as for the presence of liquid water on the surface or subsurface water-ice.

EP 3.9 Mo 17:45 AKM Foyer

Ionopausenstrukturen an Mars und Venus beobachtet von MaRS auf Mars Express und VeRa auf Venus Express — •Kerstin Peter[1], Martin Pätzold[1], Bernd Häusler[2], Silvia Tellmann[1], Dave Hinson[3] und G.L. Tyler[3] — [1]Rheinisches Institut für Umweltforschung, Köln, Deutschland — [2]Institut für Raumfahrttechnik, Uni der Bundeswehr München, Neubiberg, Deutschland — [3]Dept. of Electr. Engineering, Stanford University, California, USA

Die Ionopause eines Planeten ist definiert als Grenze zwischen planetarer Ionosphäre und interplanetarem Sonnenwind. In früheren Venus-Beobachtungen wurde diese u.a. als starker Abfall in der ionosphärischen Elektronendichte hin zu sehr kleinen Werten beobachtet. Die Marsionopause konnte aufgrund hohen Rauschens in den Viking-Elektronendichteprofilen und fehlender Höhenabdeckung durch MGS bisher nicht ausreichend untersucht werden. Mit dem Radio Science Experiment MaRS auf Mars Express konnten seit April 2004 aufgrund des stark elliptischen Orbits mehr als 400 vertikale Elektronendichteprofile der Marsionosphäre unterhalb von ca. 1500 km Höhe gemessen werden. Mit dem Radio Science Experiment VeRa auf Venus Express konnten seit Dezember 2005 bisher mehr als 140 vertikale Elektronendichteprofilen gemessen werden. Diese Studie verwendet als Ionopausendefinition eine starke Abweichung des Elektronendichtegradienten von dem Gradienten in der idealen Diffusionsregion. Vorgestellt werden die Ionopausenbeobachtungen von MaRS und VeRa der Jahre 2005 bis 2009 und es erfolgt ein Vergleich mit Ionopausenbeobachtungen früherer Missionen.

EP 3.10 Mo 17:45 AKM Foyer

The APXS (Alpha Particle X-Ray Spectrometer) within the Rosetta mission: Preliminary tests and preparations for landing on a comet — •Dirk Schmanke[1], Jordi Girones Lopez[1], Göstar Klingelhöfer[1], Jasmin Maul[1], Johannes Brückner[2], Ralf Gellert[3], and Claude d'Uston[4] — [1]Inst. für anorg. u. analyt. Chemie, JoGu-Universität, Staudinger Weg 9, Mainz — [2]Max-Planck-Institut für Chemie, Mainz — [3]Department of Physics, University of Guelph, Canada — [4]CESR, Toulouse, France

The Rosetta Mission was launched in 2004 with the main objectives to gain a better understanding of the origin and formation of comets. After 10 years the comet 67P/Churyumov-Gerasimenko will be reached and the probe will split into an orbiter and a lander. As a part of the lander payload APXS will measure in situ the chemical composition of the comet's surface and it's alteration during the trajectory of the comet around the sun. APXS combines an alpha mode for alpha spectroscopy and a x-ray mode for alpha particle/x-ray induced x-ray spectroscopy in one single instrument, being low in mass and power consumption. The cometary surface will be irradiated by a Curium 244 source, which will excite characteristic x-rays of the present elements. The alpha detectors will allow detection of elements like C and O and groups of elements with a higher Z. The x-ray-SD-detector will allow to detect most of the elements from Na to Ni. During the journey to the comet preliminary tests of the Rosetta probe and its payload at regular intervals are performed. They are used to optimize and improve the quality of the x-ray spectra of the APXS.

EP 3.11 Mo 17:45 AKM Foyer

Current-sheet driven spectral modulation of MeV electrons in the Jovian magnetosphere: Ulysses observations — •Andreas Kopp, Phillip Dunzlaff, and Bernd Heber — IEAP, Christian-Albrechts-Universität zu Kiel, 24118 Kiel

The dynamics of the Jovian magnetosphere is dominated by the planet's fast rotation with a period of about 10h. This periodicity can in particular be seen in the temporal variation of the spectral index of energetic particles. Derived from Pioneer observations, three models were developed to explain this phenomenon, the most prominent of which is the so-called Jovian clock model. Based on the observation of only a 10h periodicity being present in the data, this model predicts that this periodicity is caused only by temporal, but not by spatial variations, i.e. the observations become independent of the spacecraft's position. In order to investigate the origin of this 10h periodicity, we re-investigated data of the KET and HET instruments aboard Ulysses during the spacecraft's Jupiter flyby in February 1992. In contrast to former analyses, we could find by means of a Lomb-Scargle analysis additionally a small, but significant 5h periodicity, suggesting a connection with the current sheet. A closer analysis revealed the signal to be caused by a 10h variation due to the rotation of the magnetosphere being interrupted by crossings of the current sheet. The peaks of this 10h variation can be explained by crossings of the dipole plane with the spacecraft's trajectory. We conclude, thus, that the 10h periodicity can be explained by a simple model of the rotating, tilted dipole eld and the resulting up and down motion of the current sheet.

EP 3.12 Mo 17:45 AKM Foyer

Ergebnisse und Erfahrungen mit der Detektionssoftware ExoTrans. Die Suche nach extrasolaren Planeten in Lichtkurven des Weltraumteleskops CoRoT. — •Sascha Grziwa, Ludmila Carone und Martin Pätzold — Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Universität zu Köln, Köln

CoRoT ist ein französisches Weltraumteleskop mit deutscher Beteiligung zur Entdeckung extrasolarer Planeten, welches sich seit drei Jahren im Erdorbit befindet. In dieser Zeit wurde eine große Anzahl zu verarbeitender Lichtkurven produziert. Mit Hilfe der speziell für diese Mission entwickelten Detektionssoftware ExoTrans wird diese große Datenmenge automatisch verarbeitet und mögliche extrasolare Planeten durch Transits detektiert. Die Software kombiniert zwei verschiedene Filterverfahren (Harmonischer und Trend Filter) mit drei verschiedenen Box-Fitting Algorithmen (BLS, dcBLS, unmaxBLS). Die verschiedenen Filterverfahren und Erkennungsalgorithmen werden verglichen und die bisherigen Erfahrungen aus der ersten Weltraummission zur Entdeckung Extrasolarer Planeten beschrieben.

EP 3.13 Mo 17:45 AKM Foyer

Multi-strand coronal loop model and filter-ratio analysis — •Sofiane Bourouaine and Eckart Marsch — Max-Planck-Institut für Sonnensystemforschung, 37191 Katlenburg-Lindau, Germany

We model a coronal loop as a bundle of seven separate strands or filaments. Each of the loop strands used in this model can independently be heated (near their left footpoints) by Alfvén/ion-cyclotron waves via wave-particle interactions. The Alfvén waves are assumed to penetrate the strands from their footpoints, at which we consider different wave energy inputs. As a result, the loop strands can have different heating profiles, and the differential heating can lead to a varying cross-field temperature in the total coronal loop. The simulation of TRACE observations by means of this loop model implies two uniform temperatures along the loop length, one inferred from the 171:195 filter ratio and the other from the 171:284 ratio. The reproduced flat temperature profiles are consistent with those inferred from the observed EUV coronal loops. According to our model, the flat temperature profile is a consequence of the coronal loop consisting of filaments, which have different temperatures but almost similar emission measures in the cross-field direction. Furthermore, when we assume certain errors in the simulated loop emissions and use the triple-filter analysis, our simulated loop conditions become consistent with those of an isothermal plasma. This implies that the use of TRACE/EIT triple filters for observation of a warm coronal loop may not help in determining whether the cross-field isothermal assumption is satisfied or not.

EP 3.14 Mo 17:45 AKM Foyer

Influence of radiative loss and heat conduction on the temperature variation in of a coronal bright point — •Setareh Javadi[1], Jörg Büchner[1], Jean-Carlo Santos[1], and Antonius Otto[2] — [1]Max-Planck-Institut für Sonnensystemforschung, Max-Planck-Str.2, 37191, Katlenburg-Lindau, Germany — [2]University of Alaska, Fairbanks

Using the 3D numerical simulation model LINMOD3d a realistic approach was taken to simulate the heating processes associated with the formation of solar coronal bright points (BPs). The thermal structure of a coronal BP region was investigated by taking into account the influence of heat losses through thermal conduction and radiation. Comparing the results for cases with and without taking into account

radiative loss and heat conduction the influence of these two factors on the formation of the BP temparture is discussed.

EP 3.15 Mo 17:45 AKM Foyer

The influence of discrete scattering events on solar energetic particle propagation — •Jan Köhler and Robert F. Wimmer-Schweingruber — IEAP, Christian-Albrechts-Universität Kiel

Pitch-angle scattering in solar particle events is often described as a diffusive processes. However, the concept of the diffusion approximation breaks down if the frequency of the scattering events is small compared to the observation time. In this work we investigate the effect of rare discrete scattering events compared to frequent (diffusive) scattering, using two different models which describe energetic particle propagation in the heliosphere. For a guiding center approximation we directly compare different scattering frequencies and mean free path lengths while keeping the diffusion coefficient constant. In an ab-initio model we calculate the exact particle motion in a Parker field superimposed with magnetic fluctuations. For a given spectrum of fluctuations one can create different wave configurations which correspond to different mean free path values. For both models pitch-angle anisotropy and intensity profile both depend significantly on scattering frequency resp. mean free path.

EP 3.16 Mo 17:45 AKM Foyer

Characterization of inorganic scintillators for the HET/EPD instrument on board Solar Orbiter — •Cesar Martin, Shrinivasrao Kulkarni, Daniel Sommerfeld, Björn Schuster, Onno Kortmann, Stephan Böttcher, Robert F. Wimmer-Schweingruber, Lars Seimetz, Christiane Helmke, and Stefan Kolbe — Institut für Experimentelle und Angewandte Physik Christian-Albrecht-Universität zu Kiel, Kiel, Germany

Solar Orbiter is one of the ESA's missions planned for operating as close to the sun as 0.234 AU. The detection and characterization of the high-energy particles is one of the science requirements of the planned mission. We have designed a high-energy telescope (HET) with an inorganic scintillator crystal and semiconductor detectors. HET will detect and characterize electrons from 0.3 - 25 MeV, protons 10 - 100 MeV and heavy ions 50 - 200 MeV/n. The scintillator detector is the heart of the proposed design. Hence, characterization of the different scintillator materials is very important to select a suitable candidate for operating the instrument on the proposed orbit. Here, we will present studies performed on CsI(Tl), LaBr3, BGO and GSO including intrinsic radioactivity, quenching and temperature dependence of the light yield.

EP 3.17 Mo 17:45 AKM Foyer

Heavy pickup ions at 1 AU — •Christian Drews[1], Lars Berger[1], Robert F. Wimmer-Schweingruber[1], Antoinette B. Galvin[2], Berndt Klecker[3], and Eberhard Möbius[2] — [1]Institute for Experimental and Applied Physics, Christian-Albrechts-University zu Kiel, Germany — [2]Space Science Center & Department of Physics, University of New Hampshire, New Hampshire — [3]Max Planck Institute for Extraterrestrial Physics, Garching

Previous work has shown that pickup ions in the heliosphere are either of interstellar or solar wind origin. Because interstellar neutral He is focused by the gravitation of the Sun, count rates of interstellar He pickup ions show a distinctive peak when the observer has the Sun between himself and the interstellar inflow direction. Using the large geometric factor of the PLAsma and SupraThermal Ion Composition (PLASTIC) instrument on the Solar TErrestrial RElations Observators (STEREO) mission, we have clearly identified this so-called He focusing cone. Remarkably, not only He+ pickup ions are enhanced during these periods, but for the first time we also observe clear enhancements of Ne+ pickup ions during focusing cone passages.

The lower first ionization potentials (FIP) of Carbon and Oxygen in respect to Helium and Neon on the other hand, prevent these interstellar neutrals to penetrate deep into the heliosphere and a significant enhancement of C+ and O+ during cone passages is not observed. Indeed, the measured C/O ratio implies C+ and O+ to be primarily of solar wind origin.

EP 3.18 Mo 17:45 AKM Foyer

Inner-Source Pickup Ions as sensitive Tracers of the Inner-Heliospheric Microstate — •Robert F. Wimmer-Schweingruber[1], Jan Köhler[1], and Peter Bochsler[2] — [1]Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universiät zu Kiel, 24098 Kiel — [2]University of New Hampsire, Space Science Center & Department of Physics, Morse Hall, 8 College Road, Durham, NH 03824, USA

Inner-source pickup ions have been investigated by several workers who all assumed an initial velocity distribution function which is dominated by high velocities in the solar wind velocity frame. This is supposed to be due to the Lorentz force which acts on the freshly ionized particles. Because the location where inner-source pickup ions are ionized lies close to the Sun (probably between 5 and 25 $r_{\odot}$) and the magnetic field is near radial there, the Lorentz force acting on freshly created ions is small.

Here we show that particles desorbed from interplanetary dust particles only experience a very small mirror force in the inner heliosphere. Such pickup ions are accelerated by waves and thus serve as sensitive tracers to the level of wave-particle interactions in the inner heliosphere. The average charge state of heavy pip ions yields information about the source location.

EP 3.19 Mo 17:45 AKM Foyer

Experimental Investigation of Magnetic Flux Tubes — •Holger Stein, Jan Tenfelde, Philipp Kempkes, Felix Mackel, and Henning Soltwisch — Ruhr University Bochum, Bochum, Germany

In the frame of the FlareLab project an arc-shaped discharge, reminiscent to solar flares, is investigated. Induction probes are employed to determine the different components of the magnetic field. Combining this with information about the plasma parameters (electron density and temperature) and the velocity and width of the flux tubes, the current density profile can be calculated. This additional information is cross-checked by at least two diagnostics, including electrostatic probes, laser interferometry, basic spectroscopy and images from a fast framing ICCD camera. Furthermore, components of the magnetic data indicate frozen magnetic flux in the plasma, which originates from an external guiding field at the plasma source. The aim of this effort is a consistant characterisation of the flux tubes, in terms of force balances.

EP 3.20 Mo 17:45 AKM Foyer

3D velocity distribution functions of heavy ions and kinetic properties of fast solar wind O^{6+} at 1 AU — •Lars Berger and Robert F. Wimmer-Schweingruber — Extraterrestrial Physics, Institute for Experimental and Applied Physics, Christian-Albrechts-University Kiel, Germany

The kinetic properties of the solar wind are a result of complex interactions in the solar corona and interplanetary space. So far, observations of Velocity Distribution Functions (VDFs) of solar wind heavy ions have been solely 1D. They are known to exhibit non-thermal features, but because they are 1D projections of the 3D velocity phase space it is difficult to interpret them properly. We have modeled heavy-ion VDFs based on 3D observations of protons and alpha particles from Helios. In the model, the magnetic field vector plays a crucial role by defining the symmetry axis of the VDFs. A thermal anisotropy $T_{\parallel}/T_{\perp} \neq 1$ and a beam drifting along the magnetic field vector at a relative speed of approximately the Alfvén speed are included. The modeled VDFs are analysed using a virtual detector and then compared with data from the Solar Wind Ion Composition Spectrometer (SWICS) on the Advanced Composition Explorer (ACE). Our observations give evidence for the existence of heavy-ion beams. The projection of these beams can explain observed differential streaming. Especially the rare periods of negative differential streaming correspond to periods in which the magnetic field lines are strongly bend no longer pointing towards Earth but towards the Sun. We present in-situ measurements and derived kinetic properties of fast solar wind O^{6+} at 1 AU.

EP 3.21 Mo 17:45 AKM Foyer

On the influence of the solar differential rotation on the heliospheric magnetic field — •Phillip Dunzlaff[1], Andreas Kopp[1], Bernd Heber[1], Klaus Scherer[2], Oliver Sternal[1], and Adri Burger[3] — [1]IEAP, Christian-Albrechts-Universität zu Kiel, Leibnizstrasse 11, 24118 Kiel — [2]Theoretische Physik IV, Ruhr-Universität Bochum, 44780 Bochum — [3]School of Physics, North-West University, 2520 Potchefstroom, South Africa

The form of the field lines of the interplanetary magnetic field (IMF) is determined by the rotation of the Sun. In combination with the fact that the IMF is frozen into the solar wind, this leads to the well-known Parker spiral. While Parker's model has been verified by numerous in-situ measurements in the ecliptic plane, the question arises about the latitudinal variation of the spiral. An essential point here is the differen-

tial rotation of the Sun of about 25 days in equatorial region and more than 30 days at higher latitudes. The Ulysses mission offers the unique opportunity to investigate this question by providing solar wind and magnetic field data at high latitudes as well as larger distances from the Sun. Thus, we compare the Parker angle derived from magnetic field data with the "nominal" one, computed with the respective solar wind velocity. The analysis shows a considerably better agreement between the two angles assuming a differential rotation of the Sun rather than a rigid one, but also significant deviations in the ecliptic plane at larger distances from the Sun.

EP 3.22 Mo 17:45 AKM Foyer

Geant4-Simulations for EPT onboard Solar Orbiter — •Rolf Paspirgilis for the EPT-Collaboration-Collaboration — Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität Kiel, Leibnizstraße 11, 24118 Kiel

The ESA mission Solar Orbiter will investigate the sun's atmosphere and heliosphere from a distance between 0.23 AU and >1 AU. Onboard, the Energetic Particle Detector (EPD) will measure the composition, time series and distribution functions of suprathermal and energetic particles. The EPD consists of five seperate sensors – one of them is the Electron Proton Telescope (EPT).

The EPT is designed to detect and measure electrons, protons and α-particles with energies in the range from 20 keV to 700 keV for electrons and from 20 keV to 9 MeV for protons and α-particles. Low energy electrons and nucleons stopping in the first detector are distinguished between each other by using a foil/magnet-combination, while at higher energies the $\frac{dE}{dx}$-E-method is utilized.

We use the CERN framework Geant4 to simulate the behaviour of the EPT-design – i.e., we vary the dimensions and the setup of the design in order to determine the consequences of these variations on the particle measurement – e.g. the energy dependent geometrical factor.

EP 3.23 Mo 17:45 AKM Foyer

NMDB: towards a global neutron monitor database — •Christian T. Steigies[1] and Karl-Ludwig Klein[2] — [1]Christian-Albrechts-Universität zu Kiel — [2]Observatoire de Paris

The real-time database for high resolution neutron monitor measurements (NMDB) is a scientific data repository funded by the European Commission for two years. At the end of the NMDB project, we have successfully created a repository for Cosmic Ray data from ground based neutron monitors. We have created tools to access the data and online applications that use this data, for example to calculate cosmic ray spectra, the ionisation of the atmosphere, or to give an automatic alert of a ground-level event. So far mostly European stations are contributing to this database. To reach the full potential of a Cosmic Ray database more stations from outside Europe have to be included. NMDB is preparing workshops to discuss with international partners about their participation in a global neutron monitor database project.

EP 3.24 Mo 17:45 AKM Foyer

Almost monoenergetic ions during IP shock passages: STEREO/SEPT observations — Andreas Klassen, Raul Gomez-Herrero, Reinhold Müller-Mellin, and •Bernd Heber — IEAP, Universität Kiel, Deutschland

We present observations of ion events in the energy range of 100-1000 keV during the times of interplanetary (IP) forward shock passages associated with Corotating Interaction Regions (CIR). The detected energy spectra contain strong peaks with relative widths at half maximum (FWHM) of 0.3-0.6 and their energy maxima lie around 150 and 230 keV. The duration of the events varies from some minutes up to half an hour. These events were detected when STEREO-A or STEREO-B were relatively far away from the Earth at distances from 0.27 up to 1.0 AU.

In the past similar spectral peaks, so-called Almost Monoenergetic Ion (AMI) events, were detected during upstream events close to the Earth's bow-shock using observations on Interball-1 and STEREO A & B. We discuss the origin of these events and present indications that the narrow spectral peaks may be caused by quasi-monoenergetic beams of protons accelerated at the IP shock.

EP 3.25 Mo 17:45 AKM Foyer

Suprathermal ions with STEREO/PLASTIC — Jan-Dirk Kohlmann[1], Robert F. Wimmer-Schweingruber[1], Christian Drews[1], Lars Berger[1], and •Antoinette B. Galvin[2] — [1]Institute for Experimental and Applied Physics, Christian-Albrechts-University zu Kiel, Germany — [2]Space Science Center & Department of Physics, University of New Hampshire, New Hampshire

The PLAsma and SupraThermal Ion Composition (PLASTIC) instrument is part of the NASA Solar TErrestrial RElations Observatory (STEREO) Mission. It consists of two almost identical spacecrafts, STEREO-A (Ahead of the Earth) and STEREO-B (Behind the Earth). PLASTIC is a linear time-of-flight mass spectrometer. It is capable of measuring particles in an energyrange from 0.3 to 80 keV/e. The instrument is divided into two main apertures. The Solar wind sector (SWS) is pointing directly to the sun, it has field of view of 45° and a resolution of 1.4° in the ecliptic and ± 22.5° with a resolution of 1.4° in polar direction. The suprathermal ion Wide-Angel Partition sector (WAP) covers a range of 218° in the ecliptic and 10° in polar direction. The broad azimuthal and polar angle coverage together with the large geometry factor of the instrument allows for studies of suprathermal particles e.g. Pick-Up Ions (PUIs) in unprecedent quality. We have developed a model of PLASTIC that calculates the expected count-rates depending on the angle of incidence for any input velocity distribution. Comparing the results from this virtual detector with observations the 3D velocity distribution of ions can be reconstructed. Here we present first results for He^{1+}.

EP 3.26 Mo 17:45 AKM Foyer

Multi-point observations of CIR-associated energetic ions — Nina Dresing[1], Raul Gomez-Herrero[1], Olga Malandraki[2], Emilia Kilpua[3], •Bernd Heber[1], Andreas Klassen[1], Reinhold Müller-Mellin[1], and Robert F. Wimmer-Schweingruber[1] — [1]IEAP, Universität Kiel, Deutschland — [2]Institute for Astronomy and Astrophysics, National Observatory of Athens, Greece — [3]Department of Physical Sciences, Theoretical Physics Division, University of Helsinki, Finland

In absence of solar activity, Co-rotating Interaction Regions (CIRs) are a prevailing source of energetic ions observed near 1 AU. The twin STEREO spacecraft launched in October 2006, together with near-Earth spatial observatories offer an excellent platform for multi-point studies of CIR. Time-shifting and back-mapping techniques allow the comparison of ion increases observed by different spacecraft at different times but associated to the same CIR. The analysis shows that CIR-associated ions frequently show significant differences, particularly at sub-MeV energies. We present several cases where these differences are linked to the presence of Interplanetary Coronal Mass Ejections (ICMEs) or small-scale interplanetary transients in the vicinity or embedded in the CIR. Evidences of the possible role of ICME-CIR interaction as sources of temporal variations in the CIR-associated ion increases are presented and discussed.

EP 3.27 Mo 17:45 AKM Foyer

Mesh adaptive numerical simulation of current sheet formation at quasi-separatrix layers — •Kay Thust, Frederic Effenberger, Jürgen Dreher, and Rainer Grauer — Theoretische Physik I, Ruhr-Universität Bochum, Germany

Magnetic reconnection is thought to play a major role in the understanding of the coronal heating problem and the mechanisms leading to solar flares and coronal mass ejections. One preferential site for reconnection are thin current sheets.

To study the formation of current sheets, models without separators or null points are of particular interest. In these models quasi-separatrix layers, which are defined by a strong but still continuous variation of the field line linkage, play a role similar to classical separators.

In a numerical experiment based on ideal MHD, Aulanier et al. (A&A, 2005) studied a magnetic field configuration with a quadrupolar photospheric signature that contains a hyperbolic flux tube. As remarked by those authors, a further analysis of the small-scale structures was limited by the resolution of the numerical mesh.

To alleviate this problem, we have carried out similar MHD simulations using the technique of adaptive mesh refinement (AMR), which allowed us to achieve local resolutions of up to 8192^3 in the areas of interest, more than a factor of 10 higher than the runs by Aulanier et al. On these scales our results still largely confirm the previous work, which also showed a collapse of the current sheet down to the mesh resolution.

EP 3.28 Mo 17:45 AKM Foyer

Erkennung und Charakterisierung von Doppelsternsystemen aus Lichtkurven der Weltraummission CoRoT. — •Sascha Grziwa und Martin Pätzold — Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Universität zu Köln, Köln

Eine große Anzahl von Sternen sind selbstbedeckende Doppelsternsysteme. Sie lassen sich zum Teil an Hand ihrer Lichtkurven identifizieren und die Parameter des Systems können bestimmt werden (Massen, Halbachsen, Exzentrizität, etc.). Ein anderer Teil dieser Doppelsternsysteme lässt sich auf den ersten Blick nicht von planetaren Transits unterscheiden. Auch in den Sternfeldern des Weltraumteleskops CoRoT findet sich eine große Anzahl Doppelsterne. Die von bodengestützten Teleskopen bisher unerreichte Qualität der Lichtkurven, sowie die Länge der ununterbrochene Messungen kann zu einer genauen Bestimmung der Parameter dieser Doppelsterne genutzt werden. Mit Hilfe von theoretischen Modellen wird die Wahrscheinlichkeit der Existenz des Systems abgeschätzt. Durch diese Untersuchung werden die Doppelsternsysteme statistisch klassifiziert. Im Rahmen der Detektion von Exoplaneten dienen die Ergebnisse zur Unterscheidung zwischen Doppelsternbedeckungen und Planetentransits und der Suche nach Exoplaneten in Doppelsternsystemen.

EP 3.29 Mo 17:45 AKM Foyer

Stellar Axion Models — •Daniel Nowakowski[1], Markus Kuster[1], Achim Weiss[2], Claudia-V. Meister[1], Florian Fülbert[1], and Dieter H. H. Hoffmann[1] — [1]TU Darmstadt, Institut für Kernphysik, Schlossgartenstrasse 9, 64289 Darmstadt — [2]Max-Planck-Institut für Astrophysik, Karl-Schwarzschild-Strasse 1, 85748 Garching

An axion helioscope is typically operated to observe the sun as an axion source. Additional pointings at celestial sources, e.g. stars in other galaxies, result in possible detections of axions from distant galactic objects. For the observation of supplementary axion sources we therefore calculate the thereotical axion flux from distant stars by extending axionic flux models for the axion Primakoff effect in the sun to other main sequence stars. The main sequence star models used for our calculations are based on full stellar structure calculations. To deduce the effective axion flux of stellar objects incident on the Earth the All-Sky catalogue was used to obtain the spectral class and distance of the stars treated.
Our calculations of the axion flux in the galactic plane show that for a zero age main sequence star an maximum axion flux of $\Phi_a = 303.43\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$ could be expected. Furthermore we present estimates of axion fluxes from time-evolved stars.

EP 3.30 Mo 17:45 AKM Foyer

The X-shaped bulge of NGC 4710 — •Rainer Lütticke — Labor für Physik, Hochschule Bochum, Lennershofstr. 140

A few years ago there were several studies to classify the morphology of bulges, as being for example a peanut- or a box-shaped bulge (b/p bulge) (cf. Lütticke, Dettmar, & Pohlen, 2000, A&AS 145, 405 [LDP]). The largest study of this morphology so far (LDP) shows that 4% of all edge-on disk galaxies have a peanut-shaped bulge, 16% a box-shaped bulge, 55% an elliptical bulge, and 25% a bulge whose shape is between boxy and elliptical. However, the better the resolution of the analysed images is becoming the more peanut-shaped bulges can be detected, since fainter structures become visible in more detail. Such a highly resolved image of NGC 4710 obtained by the Hubble Space telescope was published in a press release on the 18 Nov 2009 by spacetelescope.org. The image reveals that the bulge of this galaxy is indeed peanut-shaped on both sides while LDP classified only one side of the bulge as peanut-shaped and the other as box-shaped. The X-shaped structure which is building the b/p-shape of the bulge is eye-catching and is often not resolved in "older" images of b/p bulges. However, this structure is not surprising because it is known that bars of galaxies generate a resonant bending fed by vertical diffusion of orbits and instabilities. Simulations of barred galaxies confirm the existence of such X-structures. Therefore the b/p bulge of NGC 4710 is not as "baffling" as mentioned in the press release, but the image does indeed point out the importance of highly resolved images for detailed studies of morphologies of bulges which will help to understand their formation and evolution.

EP 3.31 Mo 17:45 AKM Foyer

Particletransport in incompressible turbulent plasmas — •Sebastian Lange and Felix Spanier — Lehrstuhl für Astronomie, Uni Würzburg, 97074

The interstellar medium (ISM), which is assumed to be turbulent, can be described as a plasma, following the magnetohydrodynamics (MHD). Within this work the MHD-equations are simulated using spectral methods. These simulations generate a turbulent plasma which energy follows the predicted kolmogorov-spectrum. In this plasma the movement of testparticles is analysed.

EP 3.32 Mo 17:45 AKM Foyer

Weak Turbulence in Astrophysics — •Felix Spanier[1] and Rami Vainio[2] — [1]Lehrstuhl für Astronomie, Universität Würzburg, 97074 Würzburg — [2]Dept. of Physics, University of Helsinki, Finland

In astrophysical jets, like in AGN, but also in the solar environment weak turbulence may play an important role due to the high background fields. The evolution of weak turbulence maybe best described by three-wave interaction. We present results from three-wave interaction studies in the kinetic and dispersive regime and their influence on the particle acceleration.

EP 3.33 Mo 17:45 AKM Foyer

Langzeitmessung der Ortsdosisleistung auf Flughöhen — •Thomas Möller im Namen der RAMONA Kooperation — Universität Kiel/IEAP, 24098 Kiel

Die Erde ist fortwährend einer energiereichen Teilchenstrahlung aus dem Weltall ausgesetzt. Diese kosmische Teilchenstrahlung bildet gemeinsam mit ihren Sekundärprodukten ein natürliches Strahlungsfeld in der Atmosphäre der Erde. Die damit verbundene natürliche Strahlenexposition des fliegenden Personals unterliegt in Deutschland gesetzlichen Regelungen. Zusätzlich zu der zeitlich relativ langsam variierenden galaktischen kosmischen Strahlung kann es im Zusammenhang mit solaren Teilchenereignissen zu kurzzeitigen Veränderungen des Strahlungsfeldes in der Atmosphäre kommen. Eines der wissenschaftlichen Ziele der RAMONA Kooperation ist die experimentelle Untersuchung der Auswirkung von diesen solaren Teilchenereignissen auf das Strahlungsfeld in Flughöhen. Aus diesem Grund sind im Rahmen von RAMONA mehrere Dosimeter in Passagierflugzeugen installiert, wobei angestrebt wird, dass sich immer mindestens ein Dosimeter in Flughöhen befindet. Als Dosimetersystem wurde NAVIDOS im Rahmen der RAMONA Kooperation entwickelt und eingesetzt, hierbei kommt das DOSimetrie-TELeskop DOSTEL als Strahlungsdetektor zum Einsatz. Das DOSTEL besteht aus zwei planaren Silizium-Halbleiterdetektoren, die in Teleskopgeometrie angeordnet sind. Es sollen erste Ergebnisse der Langzeitmessung mit dem NAVIDOS gezeigt werden.

EP 3.34 Mo 17:45 AKM Foyer

Quasistable radiation belt in the slot region — •Johannes Labrenz[1], Sönke Burmeister[1], Thomas Berger[2], Günther Reitz[2], Bernd Heber[1], and Rudolf Beaujean[1] — [1]CAU Kiel — [2]DLR Köln

MATROSHKA is an ESA experiment under leadership of DLR-Cologne. The radiation exposure inside a human phantom is measured by active and passive detectors. The DOSimetry TELescope (DOSTEL) was built at CAU Kiel in cooperation with DLR Cologne; it consists of two Si-semiconductor detectors forming a telescope. Count rates as well as energy deposit spectra are measured by this instrument. MATROSHKA is on board ISS since January 2004. The active instruments were operating during the first mission phase (MTR1) where the phantom was mounted outside the ISS from February 2004 to august 2005. In 2008 the active instruments were operating again in another mission phase (MTR2b). During (MTR2b) MATROSHKA was mounted inside the Service Module of the ISS. The DOSTEL measurements shows the expected transit through the inner radiation belt (SAA) over the South Atlantic and transits through the outer radiation belt at the highest magnetic latitudes. In Sept. and Oct. 2004 an additional radiation belt in the so called slot region appeared. In this work the measurements of this quasi stable slot region belt will be presented and compared to results of other experiments.

EP 3.35 Mo 17:45 AKM Foyer

Physikalische Voraussetzungen für einen Raumfahrtantrieb mit Schwerpunktversatz durch gegenläufige Präzession — •Peter Kümmel — Amselweg 15 c, 21256 Handeloh

Schwerpunktversatz bewirkt Bewegung und umgekehrt. Gegenläufige Rotation homogener Massen erzeugt Schwerpunktversatz orthogonal zur Verbindungslinie der zwei Rotationsachsen. Wegen der hohen Ausbreitungsgeschwindigkeit von Gravitation im Verhältnis zur Massenoberflächengeschwindigkeit kommt es nur zu sehr niedrigen Ablenkungswerten. Um eine entsprechend geringe Schwerpunktversatzstrecke zu vergrößern sind die homogenen Massen durch präzessierte zu ersetzen. Referenzliteratur: ISBNs 3 921 291-00-3, -01-1, -02-X, -03-8, -04-6, und -05-4

EP 4: Heliosphere I

Zeit: Dienstag 8:30–9:45 Raum: AKM

Hauptvortrag EP 4.1 Di 8:30 AKM

Observations of the Global Interaction between the Heliosphere and its Galactic Environment: Results from the Interstellar Boundary Explorer (IBEX) — •Horst Fichtner[1] and Hans Fahr[2] — [1]Institut für Theoretische Physik IV, Ruhr-Universität Bochum, 44780 Bochum — [2]Argelander Institut für Astronomie, Universität Bonn, Auf dem Hügel 71, 53121 Bonn

The Sun moves through the local interstellar medium, continuously emitting ionized, supersonic solar wind plasma and carving out a cavity in interstellar space, called the heliosphere. The recently launched Interstellar Boundary Explorer (IBEX) spacecraft has completed its first all-sky maps of the interstellar interaction at the edge of the heliosphere by imaging energetic neutral atoms (ENAs) emanating from this region. A bright ribbon of ENA emission has been found that was unpredicted by prior models or theories. This ribbon is superposed on globally distributed flux variations ordered by both the solar wind structure and the direction of motion through the interstellar medium. The results indicate that the external galactic environment may have strong imprints on the outer heliosphere.

EP 4.2 Di 9:00 AKM

Kinetik nicht-maxwellscher Verteilungsfunktionen des turbulenten Sonnenwindplasmas — •Daniel Verscharen und Eckart Marsch — Max-Planck-Institut für Sonnensystemforschung, Max-Planck-Str. 2, 37191 Katlenburg-Lindau, Deutschland

Der Sonnenwind ist von turbulenten Fluktuationen auf nahezu jeder Skala durchsetzt. Dabei variieren sowohl elektrisches und magnetisches Feld als auch die Phasenraumkoordinaten der Sonnenwindteilchen. Dieses Verhalten muß sich in der Struktur der Phasenraumdichte widerspiegeln, die somit eine nicht-isotrope Verteilung annimmt. Messungen der Helios-Satelliten zeigten bereits in den 70er Jahren anisotrope Verteilungsfunktionen der Sonnenwindprotonen in der inneren Heliosphäre, deren Gestalt und Zustandekommen weitgehend unverstanden sind.

Der plasmakinetische Zusammenhang zwischen anisotropen Verteilungsfunktionen und der Sonnenwindturbulenz wird untersucht, wobei sich herausstellt, daß in den meisten Fällen von einer maxwellschen Verteilung, die eine direkte Anwendung der Magnetohydrodynamik (MHD) auf das turbulente Sonnenwindplasma rechtfertigen könnte, nicht ausgegangen werden darf.

EP 4.3 Di 9:15 AKM

Singular points of flow and field in ideal or slightly non-ideal MHD flows — •Dieter Nickeler, Marian Karlicky, and Miroslav Barta — Astronomical Institute Ondrejov AV CR, 25 165 Ondrejov, Czech Republic

The existence of singular points of plasma flows and magnetic fields in MHD is often correlated with reconnection scenarios. In this talk we want to shed some light on the "Anti-Reconnection" problem, as not every null point or stagnation point guarantees the existence of a reconnection process. We analyse possible configurations in the vicinity of these singular points to show how the geometrical and topological shapes of the non-ideal terms in almost ideal Ohm's law correlates with the geometrical and topological properties of the velocity fields and the magnetic fields.

EP 4.4 Di 9:30 AKM

A multifluid approach to describe the plasma passage over the solar wind termination shock — •Hans Fahr and Sergei Chalov — Argelander Institute for Astronomy, Dept.Astrophysik, University of Bonn, Auf dem Huegel 71 , 53121

It is well known that the solar wind plasma at distances larger 30 AU is a multifluid phenomenon with different ion populations centered around different energies (i.e. around a few eV, KeV, and MeV). To treat the solar wind passage over the termination shock we use a three-fluid approach considering solar wind ions, pick-up ions and anomalous cosmic ray ions as independent fluids that are dynamically and thermodynamically coupled to eachother. In a consistent view of the shock transition presented on the basis of this multifluid concept we not only can give as compared to Voyager-2 measurements the right representation of the shock precursor, but also give correct representations of the downstream plasma temperatures and the supersonic signature of the downstream solar wind plasma. The latter fact is especially relevant in view of recently obtained IBEX ENA data.

EP 5: Programmatics

Zeit: Dienstag 9:45–10:45 Raum: AKM

Hauptvortrag EP 5.1 Di 9:45 AKM

Marie Curie Actions in the 7th Framework Programme (FP7) — •Martin Lange — European Commission, DG Research, B-1049 Brussels, Belgium

FP7 is the EU's current main instrument for funding research in Europe. The broad objectives of FP7 have been grouped into four categories: **Cooperation**, **Ideas**, **People** and **Capacities**. Entirely dedicated to human resources in research, the **Marie Curie Actions** in the People Specific Programme have a significant overall budget of more than € 4,7 billion over 2007-2013. I will present the following specific actions under which the People Programme will be implemented:

- **Initial training of researchers** to improve mostly *young researchers'* career perspectives in both public and private sectors
- **Life-long training and career development** to support *experienced researchers* in acquiring new skills and competencies or in enhancing multidisciplinarity and/or intersectoral mobility
- **Industry-academia pathways and partnerships** to stimulate intersectoral mobility and increase knowledge sharing between organisations from academia and industry
- **International dimension**, to contribute to the life-long training and career development of EU-researchers, to attract research talent from outside Europe and to foster mutually beneficial research collaboration with research actors from outside Europe

Hauptvortrag EP 5.2 Di 10:15 AKM

Das Cosmic Vision 2015-2025-Programm der ESA - Status und nächste Schritte — •Wolfgang Frings und Eberhard Bachem — Deutsches Zentrum für Luft- und Raumfahrt, Königswinterer Str. 522-524, 53227 Bonn

Das Wissenschaftsprogramm der ESA ist der Grundpfeiler des europäischen Raumfahrt-Engagements. Zurzeit betreibt das ESA-Direktorat Wissenschaft und robotische Exploration 12 Satelliten im Weltraum. Neu dabei sind seit dem gelungenen Start am 14. Mai 2009 die astronomischen Missionen Herschel und Planck. Die wissenschaftliche Ausbeute aller Projekte im Betrieb ist beeindruckend. Die Fortsetzung dieses erfolgreichen Programms wird unter dem Titel Cosmic Vision 2015-2025 vorbereitet. Wissenschaftliche Schwerpunkte sind darin der Ursprung und die Zusammensetzung des Universums, die Überprüfung fundamentalphysikalischer Gesetze, die Prozesse im Sonnensystem sowie die Planetenentwicklung und die Entstehung des Lebens. Mit den technologischen Vorentwicklungen der drei Kandidaten für die erste große Mission dieses neuen Programms wurde 2009 begonnen. Aus den sechs Kandidaten für zwei mittlere Missionen mit Start 2017 oder 2018 werden im Februar 2010 drei bis vier Missionsvorschläge für die Definitionsphase ausgewählt werden. Im Vortrag werden die Inhalte und Prozesse des ESA-Wissenschaftsprogramms Cosmic Vision 2015 -2025 vorgestellt. Es wird ein Ausblick gegeben auf die weitere Entwicklung des Programms in den nächsten Jahren. Die deutsche Mitgestaltung des Programms und mögliche deutsche Beteiligungen an der Instrumentierung werden diskutiert.

EP 6: Heliosphere II

Zeit: Dienstag 14:00–15:00 Raum: AKM

EP 6.1 Di 14:00 AKM

Analytical and numerical study of dynamics of self-similarly evolving magnetic clouds — •Giorgi Dalakishvili[1,2,3], Giovanni Lapenta[2], Stefaan Poedts[2], and Andria Rogava[2,3] — [1]Institut für Weltraum und Astrophysik, Ruhr-Universität Bochum, Universitätsstrasse 150 44780, Bochum, Germany — [2]Centre for Plasma Astrophysics, K.U.Leuven, Celestijnenlaan 200B, 3001 Leuven, Belgium — [3]Georgian National Astrophysical Observatory, Chavchavadze State University, Kazbegi 2a, Tbilisi, Georgia

Magnetic clouds (MC) are "magnetized plasma clouds" moving in the solar wind. MCs transport magnetic flux and helicity from the Sun. These structures present signature of evolution in time. In our study, MCs are considered as cylindrically symmetric magnetic structures with low plasma β. In order to describe the dynamics of MCs we seek for self-similar solutions of the MHD equations. We consider longitudinal and radial expansion of MCs, and as a particular case only radial expansion is described. Also it is shown that in the self-similarly evolving, cylindrically symmetric magnetic structure the forces are balanced. We have derived explicit analytical expressions for magnetic field, plasma velocity, density and pressure. The solutions obtained here are characterized by conserved values of magnetic flux and helicity. The dynamics of self-similarly evolving MCs was investigated using the numerical code "graale“. The MCs expansion in a medium with higher pressure and higher plasma β was studied. It was shown that physical parameters maintain self-similar character.

EP 6.2 Di 14:15 AKM

Improved data analysis for EPHIN aboard SOHO — •Christoph Terasa, Raúl Gómez-Herrero, Andreas Klassen, Reinhold Müller-Mellin, and Bernd Heber — Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel

The COSTEP instrument aboard the Solar and Heliospheric Observatory (SOHO) spacecraft consists of two separate energetic particle detectors, the Low Energy Ion and Electron Instrument (LION) and the Electron Proton Helium Instrument (EPHIN). These detectors allow measurement of electrons, protons and helium of solar, interplanetary or galactic origin in the energy range of 44 keV per particle up to several tens of MeV per nucleon. The objectives of these instruments are the study of particle emissions from the Sun, the galaxy and the heliosphere. EPHIN is collecting data since the launch of the mission in December 1995 covering more than a full 11-year solar cycle. Late in 1996 one of the semiconductor detectors became noisy, affecting the quality of the data in the upper energy range. We used the energy-range empiric relation by Goulding et al. to resconstruct the energy loss of nuclei in the affected detector. New dynamic spectra and long-term quiet time spectra using these techniques are presented.

EP 6.3 Di 14:30 AKM

Spatial gradients of galactic cosmic rays in the inner heliosphere at the end of solar cycle 23 — •Jan Gieseler[1], Bernd Heber[1], Nico De Simone[2], and Valeria Di Felice[2] — [1]IEAP, Christian-Albrechts-Universität zu Kiel, 24118 Kiel, Germany — [2]INFN, Structure of Rome Tor Vergata and Physics Department of University of Rome Tor Vergata, 00133 Rome, Italy

Ulysses was launched in October 1990 in the maximum phase of solar cycle 22, reached its final, highly inclined (80.2°) Keplerian orbit around the Sun in February 1992, and was finally switched off in June 2009. During its 18 years of measurements, the spacecraft performed three so-called fast latitude scans, in 1994-1995, 2000-2001, and 2007-2008, traveling from highest southern to northern latitudes within one year. This provides the opportunity to study the propagation of galactic cosmic rays over a wide range of heliographic latitudes during different levels of solar activity and different polarities in the inner heliosphere. Because the Ulysses measurements reflect not only the spatial but also the temporal variation of the energetic particle intensities, it is essential to know the intensity variations for a stationary observer in the heliosphere. This was accomplished in the past with the IMP 8 spacecraft until it was lost in 2006. Fortunately, the satellite-borne experiment PAMELA was launched in June 2006 and can be used as a reliable 1 AU baseline for measurements of the Kiel Electron Telescope aboard Ulysses. Thus, we have the opportunity to determine spatial gradients for protons and electrons from below 1 GV to above 4 GV with an accuracy never been achieved before.

EP 6.4 Di 14:45 AKM

Time Variatons of MeV Electrons at high Latitudes and their Implications on Heliospheric Magnetic Field Models — •O. Sternal[1], R.A. Burger[2], P. Dunzlaff[1], N.E. Engelbrecht[2], S.E.S. Ferreira[2], H. Fichtner[3], B. Heber[1], A. Kopp[1], M.S. Potgieter[2], and K. Scherer[3] — [1]Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität zu Kiel, Leibnizstr. 11, 24118 Kiel, Germany — [2]School of Physics, North-West University, 2520 Potchefstroom, South Africa — [3]Institut für Theoretische Physik, Lehrstuhl IV: Weltraum- und Astrophysik, Ruhr-Universität Bochum, 44780 Bochum, Germany

The transport of energetic particles in the heliosphere is described by the Parker transport equation including the physical processes of diffusion, drift, convection and adiabatic energy changes. The Ulysses spacecraft provides unique insight into the flux of MeV electrons at high latitudes. In this contribution, we compare our model results for the Parker HMF model and the Fisk-type Schwadron-Parker HMF model to Ulysses measurements. The electron flux at high latitudes has been used as a remote sensing method in order investigate the imprint of a Fisk-type HMF on the their time profile. We show here for the first time that such an imprint exists and deduce a limitation of the Fisk HMF angle β.

EP 7: Fundamental Physics

Zeit: Dienstag 15:00–16:15 Raum: AKM

EP 7.1 Di 15:00 AKM

A new particle invariant suggested by frozen-in magnetic field lines at the solar wind termination shock — •Mark Siewert and Hans-Jörg Fahr — Argelander-Institut für Astronomie, Uni Bonn

Among other concepts, Magnetohydrodynamics introduces the frozen-in field condition, which causes magnetic field lines to be convected along with the plasma flow velocity $\vec{U}$. However, in astrophysical boundary layers (i.e. shock waves), deceleration is discontinous, and therefore, it is highly nontrivial to describe how the gyrating ions will react to this. In the past, we have studied this problem under the assumption that the classical electromagnetic invariant, the magnetic moment, is still conserved in the transition layer of the shock, which, however, results in too weak temperature gains when compared to the solar wind termination shock data taken by the Voyagers. We now present a new approach, based on the concept that decelerated frozen-in field lines lead to a local overshooting configuration, which modifies the classical gyrational motion, ultimately leading to a better agreement with the solar wind termination shock data.

EP 7.2 Di 15:15 AKM

Compressible MHD turbulence — •Christian Vogel[1,2] and Wolf-Christian Müller[1] — [1]Max-Planck-Institut für Plasmaphysik, Garching, Germany — [2]Excellence Cluster Universe, Technische Universität München, Boltzmannstr. 2, D-85748, Garching, Germany

Understanding compressible MHD turbulence is key to describing compressible magnetized turbulent flows observed in astrophysical plasmas such as the interstellar medium. We present spectral scaling relations of supersonic and super-Alfvénic compressible MHD turbulence. Results of numerical simulations of the isothermal compressible MHD equations are compared to predictions of the Fleck model of compressible

hydrodynamic turbulence. This includes self-similar scaling exponents of the turbulent velocity, the kinetic energy, and the density-weighted velocity over a range of sonic Mach numbers from subsonic flows to highly supersonic flows. Random large-scale driving of the velocity field and the magnetic field is used to keep the system in a statistically steady state. Additionally, we discuss the differing role of the non-linear turbulent energy transport in compressible and incompressible MHD turbulence.

EP 7.3 Di 15:30 AKM

Surprises in the theory of anisotropic magnetohydrodynamic turbulence — •Wolf-Christian Müller[1] and Roland Grappin[2] — [1]Max-Planck-Institut für Plasmaphysik — [2]LUTH, Observatoire de Paris

A new approach toward the analysis of high-Reynolds-number direct numerical simulations of incompressible magnetohydrodynamic (MHD) turbulence subject to a strong mean magnetic field has led to unexpected results: the scaling of one dimensional spectra taken along rays passing through the origin of Fourier space is independent of the rays' orientation with respect to the mean magnetic field direction; the spectral amplitude variation with respect to the angle between a ray and the mean magnetic field can be eliminated by normalization with an angle-dependent dissipation wavenumber. Thus the anisotropy of MHD turbulence permeated by a strong mean magnetic field does *not* appear as direction dependent scaling but rather as a direction dependent Reynolds number. These findings invalidate most present phenomenologies for macroscopically anisotropic MHD turbulence which are based on the critical balance argument.

EP 7.4 Di 15:45 AKM

Nonlinear Triad Interactions in 3D-MHD Turbulence — •Yasser Rammah and Wolf-Christian Müller — Max-Planck-Institut für Plasmaphysik, 85748 Garching

Nonlinear triad interactions in incompressible three-dimensional magnetohydrodynamic (MHD) turbulence are studied by analyzing high-resolution direct numerical simulations of decaying isotropic (512^3 grid points) and forced anisotropic ($1024^2 \times 256$ grid points) turbulence. An accurate approach of analyzing nonlinear turbulent interactions is presented. It involves the direct numerical examination of every wavenumber triad that is associated with the nonlinear terms in the differential equations of MHD in the inertial range of turbulence. The technique allows to compute spectral energy transfer and energy fluxes, as well as the spectral locality property of energy transfer. To this end, the statistical distribution of the energy transfer over all triads is examined with regard to the shape of the underlying wavenumber triads. Results show that the total, kinetic, and magnetic energy transfer is local in decaying macroscopically isotropic MHD turbulence. In anisotropic MHD turbulence subject to a strong mean magnetic field the nonlinear transfer is generally weaker and exhibits a moderate increase of nonlocality in both perpendicular and parallel directions compared to the isotropic case. These results are in contradiction with previous numerical results, but they support recent mathematical findings which also claim the locality of nonlinear energy transfer in MHD turbulence.

EP 7.5 Di 16:00 AKM

Anomalous momentum transport and plasma heating in collisionless return-current beam plasma system: multi-fluid and kinetic approaches — •Kuang Wu Lee and Jörg Büchner — Max-Planck-Institut für Sonnensystemforschung, Max-Planck-Str. 2, 37191 Katlenburg-Lindau, Germany

The anomalous transport in a one dimensional, collisionless return-current beam plasma system is studied by means of electrostatic Vlasov and three-fluid simulations. A current-free condition is applied and mimics the counter-streaming electron beams. The electron bulk drifts are dissipated due to anomalous momentum transport and electron heating. The spectrum of generated electric field fluctuations proves the charge separation effects play a major role as anomalous transport in the multi-fluid plasma. To investigate the dissipation mechanism in kinetic scale, a 1D electrostatic Vlasov code simulation is performed with same macroscopic plasma parameters. The comparison of the two different approaches shows that a much stronger drift relaxation takes place in the multi-fluid plasma approach. It was found that it spends within the same time span ($\triangle t \approx 700\ \omega_{pe}^{-1}$) to reach the same drift relaxation levels in two different approaches. This hints that charge-separation is a common mechanism of generating anomalous transport in multi-fluid plasma descriptions. By carrying out a wave-particle interaction analysis, it was shown that in kinetic plasma description Landau damping play a role to stop further current dissipation. In conclusion we obtained that an additional anomalous transport term is required for a complete multi-fluid plasma description.

EP 8: Planets and Small Bodies I

Zeit: Dienstag 16:45–19:00 Raum: AKM

EP 8.1 Di 16:45 AKM

LDEX - das Lunar Dust EXperiment der LADEE Mission — •Anna Mocker[1,2], Mihaly Horanyi[4,5], Sascha Kempf[1,3], Zoltan Sternovsky[4] und Ralf Srama[1,2] — [1]Max-Planck-Institut für Kernphysik, Heidelberg — [2]Institut für Raumfahrtsysteme, Universität Stuttgart — [3]Institut für Geophysik und extraterrestrische Physik, TU Braunschweig — [4]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, USA — [5]Department of Physics, University of Colorado, Boulder, USA

Das "Lunar Dust EXperiment"(LDEX) ist ein Einschlagsionisationsexperiment an Bord der "Lunar Atmosphere and Dust Environment (LADEE)"Mission der NASA. Es ist wurde nach dem Vorbild der Staubexperimente von HEOS2, Galileo, Ulysses und Cassini entwickelt. Das Instrument soll die Staubhülle des Mondes charakterisieren und ihre räumlichen sowie zeitlichen Schwankungen in einer Höhe von etwa 50 km vermessen. Den Voraussagen nach wird die Staubhülle des Mondes von Teilchen mit Radien unter einem Mikrometer dominiert, die wegen des ständigen Bombardements mit Mikrometeoriten und plasmainduzierten starken elektrischen Feldern nahe der Mondoberfläche aufsteigen. Deshalb kann LDEX die Massen von Staubteilchen von über 0,3 μm Radius und $1{,}7 \cdot 10^{-16}$ kg Masse bestimmen. Neben dem Nachweis von einzelnen Staubteilchen kann das Instrument den kollektiven Strom von Partikeln messen, deren Signale unterhalb der Detektionsschwelle für individuelle Einschläge liegen. LDEX wird am Staubbeschleuniger am Max-Planck-Institut für Kernphysik in Heidelberg getestet und kalibriert werden.

EP 8.2 Di 17:00 AKM

Massenspektrometrie von Staub im Sonnensystem — •Ralf Srama[1,2], Sascha Kempf[1,3], Frank Postberg[4,1], Georg Moragas-Klostermeyer[1], Anna Mocker[2,1], Sean Hsu[1,3], Harald Krueger[5], Peter Strub[1,3], Veerle Sterken[1], Mario Trieloff[4] und Eberhard Gruen[1] — [1]MPI Kernphysik, Heidelberg — [2]Univ. Stuttgart — [3]Univ. Braunschweig — [4]Univ. Heidelberg — [5]MPS, Katlenburg-Lindau

Der interplanetare Raum wird mit in-situ Instrumenten zur Messung von interplanetarem und interstellarem Staub seit vielen Jahren erforscht. Durch den Einsatz von Massenspektrometern mit großer empfindlicher Fläche und hoher Massenauflösung ergeben sich in Zukunft neue Möglichkeiten. Die Ergebnisse des Staubsensors auf der Cassini Mission haben gezeigt, welches Potenzial in der Staubspektrometrie vorhanden ist. Cassini-CDA konnte die Zusammensetzung von interplanetarem Staub, von nanometergroßen Partikeln aus dem Jupiter- und Saturnsystem, und von Ringteilchen im Saturnsystem bestimmen. Staubpartikel werden in Monden, auf Mondoberflächen, durch Kometen, in Planetenringen oder in sogar in Sternen geboren. Die Messung der Staubzusammensetzung weit entfernt von den eigentlichen Quellen erlaubt es daher, in das Innere von Monden oder Sternen zu schauen. Zukünftige Missionen wie EJSM, SP+ oder LEO bieten neue Möglichkeiten in der Staubspektrometrie.

EP 8.3 Di 17:15 AKM

Simulations of interstellar dust particle trajectories in our Solar System — •Veerle Sterken[1,2], Sascha Kempf[1,2], Nicolas Altobelli[3], Eberhard Grün[1,4], Ralf Srama[1,5], and Gerhard Schwehm[3] — [1]MPIK, Heidelberg, Deutschland — [2]IGEP, TU Braunschweig, Deutschland — [3]ESAC, Madrid, Spain — [4]University of Colorado, Boulder, US — [5]IRS, Universität Stuttgart, Deutschland

Trajectory and density simulations of interstellar dust particles (ISD) in the heliosphere are presented, and relative ISD fluxes are derived at various locations in the Solar System. Special emphasis is put on the prediction of densities and fluxes at Cassini orbit. The simulation results show a fluctuation of the particle density with the Solar Cycle. The strength and shape of this fluctuation depends on particle surface optical properties and on the particle charging. Preliminary results predict the density fluctuations at Saturn orbit to stay in a range between 0 to 5 times the ISD-density at infinity. The strongest increase of ISD flux and density is expected at Saturn between 2005 and 2012, where the peak of the increment differs in time, for different particle sizes. The simulations can help predicting and reducing the data for various other interplanetary missions.

EP 8.4 Di 17:30 AKM

Die Venus Neutralatmosphäre untersucht vom Radio Science Experiment VeRa auf Venus Express — •Silvia Tellmann[1], Martin Pätzold[1], Bernd Häusler[2], Michael Bird[3] und G. Leonard Tyler[4] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Universität zu Köln, Köln, Deutschland — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München, Neubiberg, Deutschland — [3]Argelander Institut für Astronomie, Universität Bonn, Bonn, Deutschland — [4]Department of Electrical Engineering, Stanford University, Stanford, CA, USA

Das Radio Science Experiment VeRa an Bord der ESA Mission Venus Express untersucht die Ionosphäre und Neutralatmosphäre der Venus in Erdokkultationsexperimenten. Neben Elektronendichteprofilen der Ionosphäre können so Profile der Dichte, des Drucks und der Temperatur der Atmosphäre im Höhenbereich zwischen ca. 40 und 90 km mit einer Höhenauflösung von wenigen hundert Metern gewonnen werden. Dies erlaubt eine gleichzeitige Untersuchung der Troposphäre und Mesosphäre des Planeten. Dieser Höhenbereich ist geprägt durch den Übergang von zonaler Superrotation zur solaren-antisolaren Zirkulation. Darüber hinaus befindet sich in dieser Höhe auch die Venus einhüllende Wolkenschicht des Planeten, so dass wertvolle Aufschlüsse über Struktur und Dynamik der Atmosphäre gezogen werden können. Die hohe vertikale Auflösung der Profile ermöglicht es, Wellenstrukturen zu detektieren und dynamische Prozesse zu untersuchen. Abrupte Veränderungen der vertikalen Stabilitätsstruktur erlauben es zudem, Änderungen in der mittleren Wolkenschicht zu untersuchen.

EP 8.5 Di 17:45 AKM

Mobile Asteroid Surface Scout (Mascot) - An asteroid lander package for the Hayabusa-2 mission — •Lutz Richter[1], Tra-Mi Ho[1], Lars Witte[1], Hajime Yano[2], Jean-Pierre Bibring[3], and Pierre Bousquet[4] — [1]Institute of Space Systems, German Aerospace Center (DLR), 28359 Bremen, Germany — [2]JAXA Space Exploration Center (JSPEC), Sagamihara, Jaoan — [3]IAS, CNRS/Université Paris-Sud, 91405 Orsay, France — [4]CNES, Centre Spatial de Toulouse, 18 Av. Edouard Belin, 31401 Toulouse Cedex, France

The Hayabusa-2 mission is currently being studied by JAXA/JSPEC as a sample return mission to the C-type near-Earth asteroid 1999JU3. Hayabusa-2, with launch planned for 2014, would be the immediate successor to the currently flying Hayabusa mission. Originally in the context of the proposed ESA Cosmic Vision M-class mission Marco Polo, but then following an invitation by JAXA/JSPEC, the Institute of Space Systems of the German Aerospace Center (DLR) led a proposal for a separate lander package 'Mascot' (Mobile Asteroid Surface Scout) to be carried on the mission. A feasibility study was subsequently carried out that, upon consultation with the planetary science community, assessed different concepts for the lander that converged to a package with 3 kg of P/L, for a total mass of 10-15 kg. This modest design fulfils the constraints imposed by the Hayabusa-2 mission while still offering excellent science potential. Presently, 'Mascot' enters the preliminary design phase while an Announcement of Opportunity for its payload complement is being prepared.

EP 8.6 Di 18:00 AKM

Rosetta at comet 67P/Churyumov-Gerasimenko: Spacecraft orbit modeling — •Matthias Hahn[1], Martin Pätzold[1], Silvia Tellmann[1], Jörg Selle[2], and Tom Andert[2] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Cologne, Germany — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr, Munich, Cologne

The Rosetta spacecraft has been successfully launched on 2nd March 2004 to its target comet 67P/Churyumov-Gerasimenko. The science objectives of the Rosetta Radio Science Investigations (RSI) experiment addresses fundamental geophysical aspects such as the mass and bulk density of the nucleus, its size and shape and its gravity field and internal structure. The radio carrier links between Rosetta spacecraft and the Earth will be used for these investigations. The perturbed motion of the spacecraft near the comet nucleus will cause Doppler frequency shifts of the transmitted radio carrier frequencies. These frequency shifts can be used to reconstruct precisely the flown orbit. In order to extract small changes of the carrier frequency, a prediction of the orbit is needed which includes best known estimates for all forces acting on the spacecraft. These forces are the nucleus gravity field, third body perturbations, the solar radiation pressure, the solar wind pressure, and the cometary outgassing, for example. From the differences between the predicted and observed frequency shifts it is then possible to determine iteratively low degree and order harmonic coefficients of the nucleus gravity field or the gas pressure force and the gas production rate from outgassing.

EP 8.7 Di 18:15 AKM

Rosetta Vorbeiflug an Lutetia: Simulation der Massenbestimmung durch RSI — •Martin Pätzold[1], Thomas Andert[2], Bernd Häusler[2] und Silvia Tellmann[1] — [1]Rheinisches Institut für Umweltforschung, Abt. Planetenforschung, an der Universität zu Köln, Aachenerstrasse 209, 50931 Köln — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München, Werner Heisenberg-Weg 150, 85557 Neubiberg

Am 10.Juli 2010 wird Rosetta am Asteroiden 21 Lutetia in einer Entfernung von 3100 km vorbeifliegen. Ein Ziel des Rosetta Radio Science Experimentes (RSI) ist die Massenbestimmung des Asteroiden. Die Grösse des Asteroiden (100km) lässt trotz suboptimaler Vorbeiflugsgeometrie die Hoffnung einer präzisen Massenbestimmung unter Berücksichtigung der Einschränkungen insbesondere während der kleinsten Annäherung zu. Diese Präsentation schätzt die mögliche Genauigkeit der Massenbestimmung ab und diskutiert die Implikationen für die Dichteabschätzung und Identifikation des Asteroidentyps.

EP 8.8 Di 18:30 AKM

Mössbauer Spectrometer MIMOS II on the Russian Mission Phobos-Grunt — Mathias Blumers and •Jasmin Maul — Johannes Gutenberg Universität, Mainz, RLP

Mössbauer spectroscopy is a powerful tool for quantitative mineralogical analysis of Fe-bearing materials. The scientific objectives of the Mössbauer investigation are to obtain the mineralogical identification of iron-bearing phases, the quantitative measurement of the distribution of iron among these iron-bearing phases and the quantitative measurement of the distribution of iron among its oxidation states. Two Miniaturized Mössbauer Spectrometers MIMOS II on board of the two Mars Exploration Rovers are still operational after almost 6 years of work. The MER mission has proven that Mössbauer spectroscopy is an important tool for the in situ exploration of extraterrestrial bodies, in particular the study of Fe-bearing samples. MIMOS II is part of the Russian Phobos-Grunt mission which is now scheduled to launch the end of 2011. One of the main goals of the mission is to study physical and chemical properties of the surface of the Martian moon Phobos in situ and under laboratory conditions to address questions related to primordial matter of the Solar system, and the origin of terrestrial planets. The Mössbauer Spectrometer MIMOS II for Phobos-Grunt is based on the MER version with some modifications and improvements (e.g. optimized radiation shielding of detector system). The total mass of the instrument including the electronics board is < 600g. Like on MER, MIMOS II is mounted on a robotic arm.

EP 8.9 Di 18:45 AKM

MIMOS IIa, ein kombiniertes Mössbauer und Röntgen-Fluoreszenz Spektrometer für Asteroidenmissionen — •Christian Schröder[1], Göstar Klingelhöfer[2], Bodo Bernhardt[3], Mathias Blumers[2], Iris Fleischer[2], Peter Lechner[4], Lothar Strüder[5], Jasmin Maul[2], Daniel Rodionov[2] und Dirk Schmanke[2] — [1]Universität Bayreuth und Universität Tübingen, Sigwartstr. 10, 72076 Tübingen — [2]Johannes Gutenberg-Universität Mainz — [3]vH&S, Schwetzingen — [4]PNSensor GmbH, München — [5]MPI Halbleiterlabor, München

Die NASA Mars Exploration Rover untersuchen seit Januar 2004 Gesteins- und Bodenproben auf dem Mars mit Hilfe des miniaturisiertes Mössbauer-Spektrometer MIMOS II für die Identifizierung eisenhaltiger Minerale und die Bestimmung von Eisenoxidatioszuständen sowie des Alpha Particle X-ray Spectrometer (APXS) zur Bestimmung

der elementaren Zusammensetzung. Die Entdeckung mehrerer Meteorite auf der Marsoberfläche beruht auf der Identifizierung der metallischen Fe-Ni-Phase Kamacit und dem Eisensulfid Troilit mit MIMOS II. Die APXS-Daten erlauben die Einordnung der Meteorite in Gruppen, die jeweils einem bestimmten Mutterkörper (meist Asteroiden) zugeordnet werden. Die Weiterentwicklung MIMOS IIa vereint Mössbauer- und Röntgen-Fluoreszenzspektroskopie in einem Gerät bei vergleichbarem Gewicht, Volumen und Energieverbrauch wie das Vorgängermodell und eignet sich daher ideal für Lande- und Probenrückholmissionen zu Asteroiden, deren Machbarkeit auf nationaler (z.B. ASTEX, DLR) und internationaler Basis diskutiert werden (z.B. Marco Polo, ESA-JAXA).

EP 9: Planets and Small Bodies II

Zeit: Mittwoch 8:30–10:15 Raum: AKM

Hauptvortrag EP 9.1 Mi 8:30 AKM

Frisch gezapft: Die Zusammensetzung der Eisteilchen in den Eisfontänen des Enceladus — •Frank Postberg[1,2], Sascha Kempf[1,3], Jürgen Schmidt[4], Jon Hillier[5] und Ralf Srama[1] — [1]Max-Planck-Institut für Kernphysik, 69117 Heidelberg, Germany — [2]Institut für Geowissenschaften, Ruprecht-Karls-Universität Heidelberg, 69120 Heidelberg — [3]IGEP TU - Braunschweig, 38106 Braunschweig — [4]Nichtlineare Dynamik, Universität Potsdam, 14469 Potsdam, Germany — [5]Planetary and Space Sciences Research Institute, The Open University, Milton Keynes, MK7 6AA, UK

Es werden neueste Daten von den nahen Enceladus-Vorbeiflügen der Raumsonde Cassini präsentiert. 2005 entdeckte Cassini aktiven Eisvulkanismus auf dem Saturnmond Enceladus. Beständig schießen aus warmen Spalten an dessen Südpol Jets aus Gas und Eisteilchen empor. Ein Teil der Materie entkommt der Anziehungskraft des kleinen Mondes und bildet Saturns äußeren Ring, den E-Ring.

In-situ Messungen der chemischen Zusammensetzung von Partikeln des E-Ringes mit Cassini's Staub Detektor (CDA) legen unter der Eiskruste lagerndes flüssiges Salzwasser als Quellen der Eisfontänen nahe (Postberg et al., Nature Vol.459, 2009). 2008 und 2009 tauchte Cassini bei engen Vorbeiflügen direkt in die Eisjets ein. Dadurch ist für das CDA-Team nun erstmals die Beschaffenheit frisch ausgestoßener Teilchen zugänglich. Die Zusammensetzung der Fontänen unterscheidet sich signifikant von denen des E-Ringes. Der Befund erlaubt weitergehende Rückschlüsse auf die Vorgänge unterhalb des Eispanzers dieses rätselhaften Himmelskörpers.

EP 9.2 Mi 9:00 AKM

The internal structure of Phobos derived from Radio Science measurements — •Thomas Andert[1], Martin Pätzold[2], and Bernd Häusler[1] — [1]Institut für Raumfahrttechnik, Universität der Bundeswehr, München — [2]Rheinisches Institut für Umweltforschung an der Universität zu Köln

The Mars Express spacecraft was successfully launched on 2 June 2003 and injected into orbit around Mars on 25 December 2003. The elliptical polar orbit of Mars Express allows close flybys at the Mars moon Phobos, the first close flybys since the flybys of Viking and Phobos 2 twenty years ago.

Mars Express performed two close flybys at Phobos in 2006 at 460 km and in 2008 at 275 km which resulted in a change of the orbit of Mars Express. The mass of Phobos was estimated from both flybys using the radio tracking data by evaluating the residual Doppler effect. The data of the second flyby provides a very small uncertainty of 0.3 % for the mass solution.

Mars Express will change its orbit in February 2010 which will allow a very close flyby at 62 km in March 2010. Here we report the results from the mass estimates of the flybys in 2006 and 2008 and the geophysical consequences for the internal structure of Phobos. In addition, simulation results about the feasibility of the low order coefficient J_2 of the gravity field of Phobos at the very close flyby in March 2010 are shown.

EP 9.3 Mi 9:15 AKM

Untersuchungen der Mars Neutralatmosphäre durch das Radio Science Experiment MaRS auf Mars Express — •Silvia Tellmann[1], Martin Pätzold[1], Bernd Häusler[2], G. Leonard Tyler[3] und David P. Hinson[3] — [1]Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, Universität zu Köln, Köln, Deutschland — [2]Institut für Raumfahrttechnik, Universität der Bundeswehr München, Neubiberg, Deutschland — [3]Department of Electrical Engineering, Stanford University, Stanford, CA, USA

Das auf Mars Express befindliche Radio Science Experiment MaRS sondiert die Atmosphäre und Ionosphäre des Planeten durch Verwendung zweier kohärenter Radiosignale. Vertikalprofile des Drucks, der Temperatur und der Neutralteilchendichte können somit von der Planetenoberfläche bis ca. 50 km Höhe mit einer Vertikalauflösung von wenigen hundert Metern gewonnen werden. Der hochelliptische Orbit von Mars Express erlaubt es, einen großen Bereich von Lokalzeiten und Geolokationen zu untersuchen. Bisher konnten bereits mehr als 500 Atmosphärenprofile gesammelt werden. Die hohe vertikale Auslösung der Profile gestattet es, die bodennahe Grenzschicht des Planeten hinsichtlich ihrer vertikalen Ausdehnung zu untersuchen. Darüber hinaus ist es möglich, atmosphärische Wellenstrukturen zu analysieren. Viele der bisher aufgenommenen Profile befinden sich in den hohen polaren Breiten beider Hemisphären. Vergleiche der gemessenen Temperaturen mit den Sättigungskurven des Kohlendioxids erlauben es, Rückschlüsse über CO2-Kondensation und eine eventuelle temporäre Übersättigung der Atmosphäre zu ziehen.

EP 9.4 Mi 9:30 AKM

Meteor layers in the Martian ionosphere: Observations and Modelling — •Kerstin Peter[1], Gregorio Molina Cuberos[2], Olivier Witasse[3], and Martin Pätzold[1] — [1]Rhenish Institute for Environmental Research, Dept. Planetary Research, Cologne, Germany — [2]Universidad de Murcia, Dep. Física, Facultad de Quimica, Murcia, Spain — [3]Research and Scientific Support Division of ESA, ESTEC, Noordwijk, The Netherlands

There are two main sources of the meteoric flux into planetary atmospheres: the meteoroid stream component and the sporadic meteoroid component. Models of the evolution of meteoroid streams show that they can be created by parent comets, when particles are removed from the comet's surface by nongravitational forces. The gravity influence of the sun and planets acts as a forming factor over long periods of time. The sporadic meteoroid component is the dominant source of the meteoric flux into planetary atmospheres. Interplanetary dust, i.e. from collisions in the Kuiper belt or the asteroid belt, contributes most to this component.

Observations by the radio science experiments MaRS and VeRa on Mars Express and Venus Express revealed the sporadic as well as the expected (from cometary orbit plane crossings) appearance of meteor layers in the Martian and Venusian ionosphere below the common secondary layers.

This paper will present the status of the detection of the Martian meteor layer in MaRS electron density profiles and the first steps towards the modelling of these meteor layers.

EP 9.5 Mi 9:45 AKM

Simulation of Io's auroral emission in Eclipse — •Lorenz Roth[1], Joachim Saur[1], Kurt Retherford[2], Darrell Strobel[3], and John Spencer[4] — [1]Institut für Geophysik und Meteorologie, Universität zu Köln — [2]Southwest Research Institute, San Antonio, Texas, USA — [3]Johns Hopkins University, Baltimore, Maryland, USA — [4]Southwest Reseach Institute, Boulder, Colorado, USA

Jupiter's moon Io is embedded in a dense plasma environment. Due to Jupiter's fast rotation the corotating plasma particles constantly flow past the moon. This flow of electrons and ions causes a complex plasma interaction and triggers auroral emission in the moon's atmosphere. With a three-dimensional two-fluid plasma model we simulate the plasma interaction of Io and its atmosphere-ionosphere with the Jovian magnetosphere. By using the simulated electron density and temperature profiles we are able to calculate the auroral radiation, which is generated in the moons atmosphere by collisions with magnetospheric electrons.

During the Jupiter flyby of the New Horizons spacecraft in February 2007 Io's aurora has been observed by the on board long-range visible-spectrum camera (LORRI) and simultaneously by the Hubble Space Telescope. The observations revealed a complex emission pat-

tern, where local volcanic plumes appear in the ultraviolet and visible radiation. By comparison of the observed intensity and morphology with our simulated emission we derive constraints for the distribution and density of Io's atmosphere and some abundant elements.

EP 9.6 Mi 10:00 AKM

Multifrequency Electromagnetic Sounding of the Galilean Satellites' Interiors — •Mario Seufert, Joachim Saur, and Fritz M. Neubauer — Institut für Geophysik, Universität zu Köln

We investigate the temporal variations of the Jovian magnetospheric field at the Galilean satellites' positions and analyze possible inductive responses from the moons' interiors on the basis of classical electromagnetic theory. By using a magnetospheric model that includes contributions of Jupiter's internal field, the current sheet field and fields due to the magnetopause boundary currents, we deduce the corresponding amplitude spectra at each satellite. These spectra provide the strength of inducing signals at different periods for all magnetic components. Short excitation periods (~10 hours) occur due to the fast rotation of Jupiter with respect to the moons' orbital motion. Longer periods (~40 to 400 hours) arise from contributions of the magnetopause field and due to the eccentricity and inclination of the satellites' orbits. Further we analyze various established interior models for all moons and determine answering functions for multiple subsurface conducting layers. We examine the possibility to measure signals of conductive cores in the presence of conductive subsurface liquid water and lava oceans. We also discuss suitable flyby configurations for future missions that could lead to a better understanding of the moons' interiors.

EP 10: Planets and Small Bodies III

Zeit: Mittwoch 13:45–15:00 Raum: AKM

Hauptvortrag EP 10.1 Mi 13:45 AKM

Vielfältige Winde in der Atmosphäre des Saturnmondes Titan — •Tetsuya Tokano — Institut für Geophysik und Meteorologie, Universität zu Köln, Albertus-Magnus-Platz, 50923 Köln

Die Huygens-Sonde hat zum ersten Mal das Vertikalprofil des Windes in der Atmosphäre des Saturnmondes Titan in situ gemessen. Huygens bestätigte die Existenz der Superrotation in der Stratosphäre, hinterließ jedoch auch eine komplexe Trajektorie während des Abstiegs. Das ist ein Hinweis dafür, dass die Windsysteme in der unteren Atmosphäre von Titan komplexer sind als bisher gedacht. Diese Arbeit gibt einen Überblick über die vielfältigen Windsysteme, die in der Troposphäre von Titan theoretisch vorhergesagt werden, und diskutiert, wie sie mit den Daten von Huygens und Cassini konsistent sind. Eine Reihe von thermisch und mechanisch angetriebenen Windsystemen ist in der Troposphäre vorhergesagt. Differentielle Heizung kombiniert mit den Jahreszeiten von Titan verursacht eine globale Hadleyzirkulation. Der thermische Wind erzeugt aufgrund der Temperaturabnahme vom Sommerpol zum Winterpol Ostwind im Sommer und Westwind im Winter. Schweregezeiten von Saturn verursachen rotierende Winde an mittleren und hohen geographischen Breiten. Große polare Seen können je nach der Zusammensetzung durch Temperaturunterschiede zwischen See und Land auflandige oder ablandige Winde in Gang setzen. Topographie beeinflusst die atmosphärische Zirkulation mechanisch. Konvektive Wolken bringen lokale Aufwinde und Böen mit sich.

EP 10.2 Mi 14:15 AKM

Titan's highly dynamic magnetic environment: A systematic survey of Cassini MAG observations from flybys TA-T62 — •Sven Simon[1], Fritz M. Neubauer[1], Alexandre Wennmacher[1], Hendrik A. Kriegel[2], and Joachim S. Saur[1] — [1]Institute of Geophysics and Meteorology, University of Cologne, Germany — [2]Institute for Theoretical Physics, TU Braunschweig, Germany

We analyze the variability of the ambient magnetic field near Titan during Cassini encounters TA-T62 (October 2004–October 2009). Cassini MAG data show that the moon's magnetic environment is strongly affected by its proximity to Saturn's warped and highly dynamic magnetodisk. In the nightside sector of Saturn's magnetosphere, the magnetic field near Titan is controlled by intense vertical flapping motions of the magnetodisk current sheet, alternately exposing the moon to radially stretched lobe-type fields and to more dipolar, but highly distorted current sheet fields. In southern summer, when most of the Cassini encounters took place, the magnetodisk current sheet was on average located above Titan's orbital plane. However, around equinox in August 2009, the distortions of Titan's magnetic environment due to the rapidly moving current sheet reached a maximum, thus suggesting that the equilibrium position of the sheet at that time was significantly closer to the moon's orbital plane. In the dayside magnetosphere, the formation of the magnetodisk lobes is partially suppressed due to the proximity of the magnetopause. Therefore, during most encounters that took place near noon, Titan was embedded in highly distorted current sheet fields.

EP 10.3 Mi 14:30 AKM

Größenhäufigkeitsverteilung der Einschlagskrater Populationen auf den Saturnmonden und Vergleich mit der Körper Größenhäufigkeitsverteilung der Hauptgürtelasteroiden und irregulären Saturnmonden — •Nico Schmedemann[1], Gerhard Neukum[1], Oliver Hartmann[1], Roland Wagner[2] und Tilmann Denk[1] — [1]Institut für Geologische Wissenschaften, Freie Universität Berlin, Berlin, Deutschland — [2]Institut für Planetenforschung, DLR Berlin, Deutschland

Auf Basis von Cassini ISS Daten, kann die Untersuchung der Größen-Häufigkeitsverteilung (size-frequency distribution (SFD)) von Impaktkratern auf den mittelgroßen Saturnmonden dazu genutzt werden, um die Quelle der Impaktoren zu lokalisieren.

Die Form der auf Iapetus und anderer Monde gemessenen SFD ähnelt über bis zu vier Größenordnungen im Kraterdurchmesser sehr stark derjenigen des Erdmondes (nach Korrektur bzgl. spezifischer Einschlagsbedingungen; Neukum et al. 2006). Dies trifft auch für die Größenhäufigkeitsverteilung der Asteroiden des Hauptgürtels in der Nähe der 3:1 Resonanzlücke mit Jupiter zu. Diese Messergebnisse sind ein starkes Indiz für die Hypothese, dass der überwiegende Anteil kraterbildender Impaktoren auf dem Erdmond und auf den Saturnmonden einer gemeinsamen Population entstammen, welche die gleiche SFD-Charakteristik aufweist wie die SFD der Asteroidenkörper im angegeben Bereich. Ein weiterer Hinweis auf asteroidale Impaktoren sind die irregulären Saturnmonde, die eine SFD zeigen, die recht gut mit der SFD von Asteroiden der Hecuba Lücke (3,4-3,9 AE) übereinstimmt.

EP 10.4 Mi 14:45 AKM

Energetic particle injection events in the Kronian magnetosphere — •Anna L. Müller[1,2], Joachim Saur[1], Norbert Krupp[2], and Stamatios M. Krimigis[3] — [1]Institute of Geophysics and Meteorology, University of Cologne, Cologne, Germany — [2]Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany — [3]Applied Physics Laboratory, Johns Hopkins University, Laurel, Maryland, USA

We study the azimuthal plasma velocity in Saturn's magnetosphere between 3 and 13 Saturn radii (Rs) by analysing energetic particle injection events using data of the Magnetospheric Imaging Instrument (MIMI) onboard the Cassini spacecraft in orbit around Saturn. Due to the magnetic drifts, the injected particles at various energies begin to disperse and leave an imprint in the electron as well as in the ion energy spectrograms of the MIMI instrument. The shape of these profiles strongly depends on the azimuthal velocity distribution of the magnetospheric plasma and the age of the injection event. Comparison of theoretically computed dispersion profiles with observed ones enables us to characterize the azimuthal flow of the plasma. The measured flow profile clearly shows that the plasma subcorotates with velocities as low as 80 % of full corotation at radial distances between 8 Rs to 13 Rs. With knowledge of the flow profile and the ages of each injection event we can calculate the location where the energetic particles were injected into the inner magnetosphere. The night and morning sector of the Kronian magnetosphere are preferred regions for the generation of hot plasma injections.

EP 11: Exoplanets

Zeit: Mittwoch 15:15–16:45 Raum: AKM

EP 11.1 Mi 15:15 AKM

Warum der Mangel an kurzperiodischen massiven Exoplaneten? — •Ludmila Carone und Martin Pätzold — Rheinisches Institut für Umweltforschung, Abteilung Planetenforschung, an der Universität zu Köln

Insgesamt 407 extrasolare Planeten wurden seit 1995, der Bekanntgabe des ersten extrasolaren Planeten um einen sonnenähnlichen Stern, gefunden. Bei den meisten handelt es sich um Gasriesen, die in engen Umlaufbahnen um ihre Sterne kreisen. Obwohl schwere Planeten mit extrem kurzperiodischen Bahnen bevorzugt entdeckt werden sollten, scheinen Planeten mit großen Halbachsen unter 0,03 AE relativ selten zu sein. Die beiden kurzperiodischsten und gleichzeitig massiven Planeten WASP-18b und WASP-19b wurden erst 2009 entdeckt.

Wir erklären den Mangel an massiven extrasolaren Planeten auf extrem kurzen Umlaufbahnen durch den Austausch von Gezeitenkräften. Dieser führt je nach angenommenem Gezeitendissipationskoeffizienten über der Lovezahl zweiter Ordnung (Q*/k2*) zu einer Abnahme der großen Halbachse des Planeten, bis dieser das Rochelimit erreicht und zerstört wird. WASP-18b und WASP-19b sind daher seltene Vertreter von Planeten, die gerade aufgrund der Gezeitenwechselwirkung Richtung Stern wandern.

EP 11.2 Mi 15:30 AKM

Scientific Analysis of CoRoT Light Curves — •Juan Cabrera — Institut für Planetenforschung - DLR - Rutherfordstr. 2 12489 Berlin

The CoRoT satellite was launched on December 2006 with two goals: the search for extrasolar planets and the study of the internal structure of stars. So far, six planets and a brown dwarf (with 20 Jupiter masses) have been reported and several results on stellar seismology have been published.

This presentation will show the treatment of the data provided by the satellite CoRoT and the different tools used to analyze the signal. A careful study of the scientific output, the light curves, provides information about the presence of planets, results about the thermal structure of the transiting planet through the analysis of the secondary eclipse, the search for multiple planetary systems through the perturbations in the ephemeris of transits, the search for reflected light of non transiting planets, the study of the stellar activity of the star, the interactions between the star and the planet and the search for moons and rings around transiting planets. Interesting results in these areas will be presented.

EP 11.3 Mi 15:45 AKM

Structure and Composition of the CoRoT-7b Exoplanet — •Frank W. Wagner, Frank Sohl, Hauke Hussmann, Heike Rauer, and Matthias Grott — Institute of Planetary Research, German Aerospace Center, Berlin, Germany

The field of planetary sciences is rapidly expanding due to the growing number and unexpected diversity of discovered planets beyond the solar system. CoRoT-7b is the first exoplanet among more than a dozen low-mass ($< 15\ M_\oplus$) extrasolar planets for which the radius *and* mass have been accurately determined. In units of Earth equivalents, these are $1.68 \pm 0.09\ R_\oplus$ (Léger et al. 2009) and $4.8 \pm 0.8\ M_\oplus$ (Queloz et al. 2009), respectively. The average compressed density of CoRoT-7b of 5.6 ± 1.3 Mg m^{-3} is comparable to the Earth's (5.515 Mg m^{-3}) and suggests a terrestrial-type bulk composition. We model the internal structure of CoRoT-7b as a type example for a terrestrial extrasolar planet using mass and energy balance constraints. Our results suggest that CoRoT-7b may represent a dry, rock-rich planet predominantly composed of silicates, similar to the Earth's Moon (Wagner et al. 2009). An iron-rich core at depth would be small and less massive or even non-existent, suggesting that CoRoT-7b may have originated in the iron-depleted region beyond the snowline and lost its volatile mass fraction when subsequently moving toward its primary.

Acknowledgments This research is supported by the Helmholtz Alliance "Planetary Evolution and Life".

EP 11.4 Mi 16:00 AKM

Gravitational Perturbations in Exoplanetary Systems — •Szilard Csizmadia[1] and CEST Team[2] — [1]DLR, Intitut für Planetenforschung — [2]-

Studying exoplanets is a very new research field of astrophysics. The sequence of discoveries started only in 1995 and more than 400 planets were discovered around other stars than the Sun in the last 15 years. Most of these exoplanets is known to be lonely planet around its host star, but few real planetary systems are also known. It is believed that there are more planets and small bodies in every system just we did not detected those planets.

To find additional objects in the systems, one promising technique is the so-called transit timing variation method which measures the tiny orbital period changes of a transiting exoplanets and it tries to reconstruct the origin of these period chhanges. Note that Neptune was discovered by a similar way.

Here I summarize the types of gravitational perturbations in a planetary system, the role of Kozai-resonance in the formation and evolution of the systems. I also present our results about the transiting exoplanet CoRoT-1b.

EP 11.5 Mi 16:15 AKM

Plasma interaction between exoplanets and their host stars — •Timo Grambusch and Joachim Saur — Institut für Geophysik und Meteorologie, Universität zu Köln, Zülpicher Str. 49a, D-50674 Köln

We present a method to calculate the energy flux, which is transported by plasmawaves from exoplanets to their host stars.

In the last fourteen years more than 400 exoplanets have been discovered and most of them are so-called Hot Jupiters. Those planets have a short semi-major axis (< 0.1 AU) and a mass in the order of Jupiter's mass. For some of these planets the stellar wind is sub-Alfvénic, which means that no fast-shock is present and an Alfvén wing forms. In this case the interaction is similar to the Io-Jupiter interaction where the Alfvén wing produces a footprint in the ionosphere of Jupiter.

For our calculations we assume that the main contribution of the energy flux is carried by the integrated Poynting flux. We discuss how the energy flux depends on the extend of the magnetosphere, the stellar wind velocity, the stellar magnetic field and other parameters. Finally, we will provide the total energy fluxes for several exoplanets, where observational hints for a planet-star connection exist.

EP 11.6 Mi 16:30 AKM

On the Detectability of Biomarkers in Extrasolar Super-Earth Atmospheres — •Heike Rauer[1,2], Adrian Belu[3], Stefanie Gebauer[1], Mareike Godolt[1], John Lee Grenfell[1], Daniel Kitzmann[1], Beate Patzer[1], Franck Selsis[3], Barbara Stracke[2], and Philip von Paris[2] — [1]Zentrum für Astronomie und Astrophysik, Technische Universität Berlin (TUB), Hardenbergstr. 36, 10623 Berlin, Germany — [2]Institut für Planetenforschung, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Rutherfordstraße 2, 12489 Berlin, Germany — [3]Laboratoire d'Astrophysique de Bordeaux, CNRS, Universite Bordeaux 1, BP89, 33270, Floirac, France

The presence of biomarker molecules in the atmospheres of terrestrial planets is usually interpreted within the context of biological activity. However, the instrumental design requirements for the detection of such species are demanding because of the weak signals. In this contribution we present detailed studies of spectral resolutions and signal-to-noise ratios achievable with currently proposed space telescopes for emission and transmission spectra of Super-Earth planets.

EP 12: Astrophysics I

Zeit: Donnerstag 8:30–10:30 Raum: AKM

Hauptvortrag EP 12.1 Do 8:30 AKM

Herschel, a new Window to the Infrared Universe — Franz Kerschbaum and •Roland Ottensamer — University Vienna, Vienna,

In May 2009 the infrared space telescope Herschel was launched to L2. An overview of its new possibilities, its technology and early exploratory results will be given.

EP 12.2 Do 9:00 AKM

Herschel, a new Window to the Infrared Universe — •Franz Kerschbaum and Roland Ottensamer — University Vienna, Vienna, Austria

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EP 12.3 Do 9:15 AKM

Simulationen zum IXO WFI Detektorhintergrund — •Steffen Hauf[1], Markus Kuster[1], Dieter H.H. Hoffmann[1], Eckard Kendziorra[2], Alexander Stefanescu[4,5], Lothar Strüder[3,4] und Chris Tenzer[2] — [1]IKP, TU Darmstadt — [2]IAA Tübingen — [3]MPE, Garching — [4]MPI HLL, München — [5]Johannes Gutenberg-Universität Mainz

Das International X-ray Observatory (IXO) ist ein geplantes satellitengestütztes Röntgenteleskop, welches einen Energiebereich von 0.1-40 keV abdecken wird. Die benötigte Fokallänge von 20m soll durch eine ausfahrbare Struktur erreicht werden. Die Stationierung in L2 ermöglicht nahezu kontinuierliche Observationen. Um schwache Quellen beobachten zu können, wird eine hohe Sensitivität benötigt, welcher der durch kosmische Strahlung induzierte Detektorhintergrund entgegen steht. Aktuelle Missionen werden deshalb oft mit Hilfe von Monte-Carlo Simulationen auf den zu erwartenden Hintergrund hin untersucht, um so ihre Abschirmungskonzepte zu optimieren. Häufig wird hierzu Geant4 verwendet, dessen elektromagnetische und hadronische Komponenten durch boden- und weltraumgestützte Experimente hinreichend verifiziert wurden. Wir werden erste Ergebnisse zum Protonen und Gamma induzierten Strahlungshintergrund des Wide-Field-Imagers (WFI) an Bord von IXO vorstellen, die zeigen, dass mit der für den WFI verwendete DEPFET-Technologie eine Verbesserung des mittleren differenziellen Detektorhintergrundes erreicht werden kann. Wir präsentieren außerdem erste Optimierungsansätze des mechanischen Detektordesigns und der Datenprozessierung für den WFI.

EP 12.4 Do 9:30 AKM

Modelling the attitude of the Gaia spacecraft — •Ralf Keil[1], Daniel Risquez[2], Floor van Leeuwen[3], and Anthony Brown[2] — [1]ZARM, Bremen, Germany — [2]Leiden Observatory, Leiden, The Netherlands — [3]Institute of Astronomy, Cambridge, United Kingdom

Modelling the attitude of a satellite is an essential part of the data processing chain for various scientific missions, reaching from past to future projects. For the upcoming European astrometry mission Gaia, the desired accuracy of the scientific output is only achievable, if the behaviour of the satellite can be understood to a very high degree.

The 'Gaia Attitude Model' (GAM) focusses on the development of a simulation environment based on physical principles and effects, complemented by information from the onboard architecture of software and hardware to control the satellite's motion in space. This talk presents the major parts of the GAM and shows the steps in the development of a high-precision tool for simulating Gaia's attitude.

EP 12.5 Do 9:45 AKM

Perseus Cluster Observations with MAGIC — •Jan Storz for the MAGIC-Collaboration — Lehrstuhl für Astronomie, Uni Würzburg, Germany

The Perseus Cluster is a promising candidate for gamma-ray detection in the very high-energy range (VHE, >100 GeV). The analysis of recent observations with MAGIC of Perseus' central galaxy NGC-1275 with specific focus on Dark Matter searches will be covered in this talk.

EP 12.6 Do 10:00 AKM

Inverser Compton-Effekt und Annihilation supersymmetrischer Dunkelmaterie — •Alexander Summa — Institut für Theoretische Physik und Astrophysik, Universität Würzburg

Neben der direkten Gammastrahlung entstehen in Annihilationsprozessen supersymmetrischer Dunkelmaterie hochenergetische Elektronen und Positronen. Diese wechselwirken über Invers-Compton-Streuprozesse mit Photonen des Sternenlichts und des primordialen Mikrowellen-Hintergrunds und erzeugen so potentiell detektierbare Signale im weichen bis harten Röntgenbereich. Im Rahmen der Herleitung des Invers-Compton-Beitrags für Dunkelmaterie-Verteilungen in Galaxien-Clustern wird am konkreten Beispiel von M87 auf Möglichkeiten zur Identifikation von Signaturen dunkler Materie im Multi-Wellenlängen-Spektrum eingegangen.

EP 12.7 Do 10:15 AKM

The influence of the mass-ratio on particle acceleration by filamentation instabilities — •Thomas Burkart and Felix Spanier — ITPA, Uni Würzburg, Würzburg, D

Up to now it is not yet clear what the actual composition of the jets of Active Galactic Nuclei is. Radiation models so far prefer either a pure leptonic or hadronic composition, but it can be safely assumed that protons as well as electrons and positrons are present in AGN jets. In recent PIC simulations of colliding plasma streams pure electron-positron or electron-proton plasmas have been considered. Our approach is now to consider mixed plasma of protons, electrons and positrons. This will give us an insight to the possible instabilities taking place in the mixed modes. The interesting point is that due to the different masses the magnetic field increase may be modified. We have undertaken simulations of mixed mode plasmas using different mass ratios. Our research shows the influence of the mass ratio and the composition on the magnetic field generated by the filamentation instability. Also the energy spectra of high mass and low mass particles are compared.

EP 13: Astrophysics II

Zeit: Donnerstag 14:00–16:15 Raum: AKM

EP 13.1 Do 14:00 AKM

Calculations for the Anisotropic Diffusion of Protons in the Milky Way — •Frederic Effenberger, Stephan Barra, Horst Fichtner, and Klaus Scherer — Theoretical Physics IV, Ruhr-Universität Bochum, Germany

The distribution of cosmic ray protons in our Galaxy on long timescales is of fundamental physical interest, especially in the context of "Interstellar-Terrestrial Relations". The long-term variation of the cosmic ray flux and its implications for the climate on Earth is a major issue in this discussion.

In this talk we will present results of our modeling in cosmic ray transport. In particular, we incorporate anisotropic diffusion into the numerical solution to the well-known Parker transport-equation. This approach has already been successfully applied to various heliophysical problems and we are now transferring our knowledge to galactic scale. There, the Parker equation can also be extended to include energy losses due to pion production. Important inputs to the physical model are various recent results from theory and observational astronomy on galactic magnetic field structure, galactic winds, cosmic ray sources and diffusion parameters.

EP 13.2 Do 14:15 AKM

The Anisotropic Diffusion Tensor for an Arbitrary Magnetic Field — •Stephan Barra, Frederic Effenberger, Horst Fichtner, and Klaus Scherer — Institut für theoretische Physik IV, Ruhr-Univerität Bochum

Anisotropic diffusion is used to describe the transport of energetic particles in the solar wind, like electrons from jupiter. It should, however,

also be applied to the transport of cosmic rays through the galaxy and its magnetic field. Because the detailed pattern of the Milky Way's magnetic field is still under discussion, one has to explore the related structure of the anisotropic spatial diffusion tensor for an arbitrary magnetic field. Neglecting particle drifts, this tensor has diagonal form in a local reference frame with respect to the magnetic field and has to be transformed into a global frame. Results from a mathematically rigorous derivation will be illustrated and compared to previously used forms.

EP 13.3 Do 14:30 AKM

Proton-Proton Kollisionen in relativistischen Plasmawolken — •Björn Eichmann[1], Wolfgang Rhode[1] und Reinhard Schlickeiser[2] — [1]TU-Dortmund, E5b — [2]Ruhr-Universität Bochum, TP IV

Nicht-thermische Strahlungsphänomene extragalaktischer Objekte werfen noch immer eine Vielzahl von Fragen auf. Die Beobachtung hochenergetischer, extragalaktischer Neutrinos könnte sich dabei als wegweisend zur Beantwortung der Frage nach dem leptonischen oder hadronischen Ursprung der Phänomene auszeichnen. Ein vieldiskutiertes Entstehungsszenario dieser Neutrinos ist das Folgende:

Ausgehend von einer hochrelativistischen Plasmawolke, wie sie in den Jets einiger aktiver galaktischer Kerne (AGN) beobachtet wurde, werden umgebende Teilchen (Protonen und Elektronen) von diesem Plasmoidsystem aufgesammelt. Die injizierten Protonen sind im Ruhesystem des Plasmoiden hochrelativistisch und diffundieren durch das endliche Volumen, wobei sie in Stoßprozessen mit dem Hintergrundplasma geladene und ungeladene Pionen erzeugen. Diese zerfallen wiederum in hochenergetische Neutrinos und Gammateilchen.

In einer Kombination aus analytischen und numerischen Methoden wird die zeitliche und räumliche Entwicklung der Teilchenpopulationen in dem endlichen Plasmoidvolumen von der Protoneninjektion bis hin zur Neutrino- und Gammaemission vorgestellt.

EP 13.4 Do 14:45 AKM

Semi-analytical model of cosmic ray electron transport — •Alex Ivascenko and Felix Spanier — ITPA, Universität Würzburg

Recently the leptonic component of the cosmic ray spectrum has gained new attention. New observations from ATIC, PAMELA and Fermi show a deviation from a power-law in the form of an excess in both the electron and positron spectra. Annihilating dark matter and nearby pulsars (among other things) have been proposed as possible sources of the excess leptons. Regardless of the source, a new propagation model is needed to connect the energy spectrum measured on earth with the injection spectra. We present our numerical cosmic ray transport model in application to the high energy electron transport in the ISM. Spatial and momentum diffusion, particle escape, acceleration via Fermi I and continuous energy losses were taken into account and their effects on the steady-state energy spectrum analyzed. In solving the transport equation we employed quasi-linear transport theory, the diffusion approximation and a separation of the spatial and momentum problem to obtain the leaky-box-equation, which was then solved numerically. The spatial problem was solved analytically in cylindrical and prolate spheroidal coordinates. We found that despite the many simplifications we are able to reproduce the general shape of the high energy electron spectrum.

EP 13.5 Do 15:00 AKM

Klein-Nishina Stufen im Energiespektrum galaktischer kosmischer Elektronen — •Patrick Blies, Jens Ruppel und Reinhard Schlickeiser — Theoretische Physik IV, Ruhr-Universität Bochum

ATIC, PAMELA, FERMI und HESS haben im Energiespektrum galaktischer kosmischer Elektronen im Bereich einiger hundert GeV eine spektrale Struktur gemessen, die durch ein reines Potenzgesetz nicht erklärt werden kann. Es scheint eine zusätzliche Quelle von Elektronen zu geben, die bisher nicht bekannt war. Über die Natur dieser Quelle wird viel spekuliert: als mögliche Kanditaten sind sowohl nahe astrophysikalische Objekte wie z.B. Mikroquasare als auch die Annihilation Dunkler Materie im Gespräch.

Wir versuchen jedoch, diese Struktur durch einen klassischen Effekt zu erklären. Auf dem Weg durch die Galaxie untergehen Elektronen den verschiedensten Wechselwirkungsprozessen, unter anderem auch inverser Comptonstreuung an optischen Photonen. Der Wechselwirkungsquerschnitt dieses Prozesses wurde bisher durch den Thomson-WWQ angenähert. Für optische Targetphotonen ist jedoch der Klein-Nishina-WWQ angebracht. Dies führt zu einer signifikanten Reduktion der Energieverlustrate durch inverse Comptonstreuung und zu Strukturen im Energiespektrum, die keinem reinen Potenzgesetz gehorchen.

EP 13.6 Do 15:15 AKM

Nucleosynthesis in neutrino-driven winds — •Almudena Arcones — Institut für Kernphysik, TU Darmstadt, Schlossgartenstr. 9, D-64289 Darmstadt, Germany — GSI Helmholtzzentrum für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany

The specific mechanism and astrophysical site for the production of half of the heavy elements, the so-called r-nuclei, remains to be found. We address the problem aking improvements along two main fronts: the astrophysical environment and the properties of the nuclei far from stability. Observational data indicate that there are two components. The heavy r-process nuclei (A>130) are produced by rapid neutron capture in a yet unknown site. The other component corresponds to the "lighter heavy nuclei" or weak r-process. These nuclei are produced by charge-particle reactions (CPR) in what it was also known as light element primary process (LEPP). Our nucleosynthesis studies are based on trajectories of hydrodynamical simulations for core-collapse supernovae and their subsequent neutrino-driven winds. We show for the first time that CPR elements can be produced in neutrino-driven winds and we relate their abundances to the neutrino emission from the nascent neutron star. Based on the latest hydrodynamical simulations, heavy r-process elements cannot be synthesized in the neutrino-driven winds. However, by artificially increasing the wind entropy, elements up to A=195 can be made. In this way one can mimic the general behavior of an ejecta where the r-process occurs. We use this approach to study the impact of the nuclear physics input and of the long-time dynamical evolution on the final abundances.

EP 13.7 Do 15:30 AKM

Optische Pulsation im Doppelsternsystem Her X-1/HZ Her — •Matthias Kühnel für die Hercules X-1-Kollaboration — TU Darmstadt, IKP, Schlossgartenstrasse 9, 64289 Darmstadt

Im Jahre 1976 beobachteten Middleditch und Nelson erstmals periodische Pulsation im Spektralbereich des optischen Lichts vom Röntgendoppelsternsystem Hercules X-1/HZ Hercules. Dieses System besteht aus einem akkretierenden Neutronenstern und einem Begleitstern vom Spektaltyp B3-B4. Wegen der Übereinstimmung der beobachteten Pulsperiode mit der im Röntgenlicht beobachteten Rotationsperiode des Neutronensterns von 1,24 s, interpretierten Middleditch und Nelson dies als in der Atmosphäre des Begleiters reprozessierte Röntgenstrahlung. Weitere Beobachtungen des Doppelsterns konnten Pulsationen im optischen Spektralbereich jedoch über einen langen Zeitraum nicht verifizieren. Unsere Analysen von Daten aus dem Jahr 2001 können diese Beobachtungen nun zum ersten Mal seit 30 Jahren bestätigen. Die Form des Pulsprofils und die Stärke der Pulse bei verschiedenen Wellenlängen lassen Rückschlüsse auf eine Reprozessierung von Röntgenstrahlen im Plasma von HZ-Her zu. Mit Hilfe der gemessenen Dopplerverschiebung der beobachteten Pulsperioden können die Reprozessierungsgebiete auf dem Begleitstern HZ-Her eingeschränkt werden.

EP 13.8 Do 15:45 AKM

Kapteyn-Reihen in der theoretischen Astrophysik — •Robert C. Tautz — Sterrenkundig Instituut Utrecht

In vielen analytischen Rechnungen der theoretischen (Astro-)Physik treten unendliche Reihen über Besselfunktionen (meist erster Art) und sog. Kapteyn-Reihen auf. Leider ist das Wissen über die Behandlung solcher Reihen nicht allzu verbreitet, so dass häufig auf (oft zeitaufwändige) numerische Verfahren oder (allzu drastische) analytische Näherungen zurückgegriffen wird. In vielen Fällen ist dies beides jedoch übereilt! Im Vortrag werden daher das typische Aussehen solcher Reihen, mögliche Herangehensweisen und Tricks erläutert, wie man auch abschreckend aussehende Reihen meistern kann. Darüber hinaus werden einige Anwendungsbeispiele aus der Transporttheorie kosmischer Strahlung, der Dipolstrahlung von Pulsaren und der Theorie der Plasma-Instabilitäten anschaulich dargestellt.

EP 13.9 Do 16:00 AKM

Ergebnisse der Suche nach Neutrinos von SN2008D mit IceCube — •Nick Kemming[1] und Marek Kowalski[2] für die IceCube-Kollaboration — [1]mail@nickkemming.com — [2]mkowalsk@physik.huberlin.de

Am 9. Januar 2008 gelang dem Röntgen-Satellit SWIFT die erste direkte Beobachtung einer Supernova (SN) vom Typ Ibc unmittelbar

bei der Explosion. Aktuelle Modelle socher Kernkollaps-SN gehen davon aus, dass diese - ähnlich wie Gamma-Ray-Bursts - Jets ausbilden können. Bei deren Durchbruch durch die stellare Hülle kann es neben Röntgenemission auch zur Produktion hochenergetischer Neutrinos (> 100 GeV) kommen. Der Nachweis hochenergetischer Neutrinos könnte die vermutete Verbindung zwischen GRBs und Kernkollaps-SN bestätigen und entsprechende Modelle quantitativ einschränken. IceCube, das im Bau befindliche Neutrino-Observatorium am Südpol, war zum Zeitpunkt der SN Daten genommen. Simulationen ergaben, dass durch die exakte Kenntnis des Zeitpunkts, zu dem die kosmischen Neutrinos zu erwarten sind, eine Signifikante Detektierung möglich wäre. In dem Vortrag werden die Daten-Analyse und die Ergebnisse der Suche vorgestellt.

EP 14: Astrophysics III

Zeit: Donnerstag 16:45–17:00 Raum: AKM

EP 14.1 Do 16:45 AKM

R&D on the Geant4 Radioactive Decay Physics — •Steffen Hauf[1], Markus Kuster[1], Philipp-M. Lang[1], Maria Grazia Pia[2,3], Zane Bell[4], Dieter H.H. Hoffmann[1], Georg Weidenspointner[5,7], and Andreas Zoglauer[6] — [1]IKP, TU Darmstadt, DE — [2]CERN, Genf, CH — [3]INFN, Genua, IT — [4]Oak Ridge National Lab, USA — [5]MPI HLL, München, DE — [6]SSL, Berkeley, USA — [7]MPE, Garching, DE

The anticipated high sensitivity of the next generation X-ray space missions, like the International X-ray Observatory, rely on a low instrumental background, which in turn requires optimized shielding concepts for the instruments. Most state-of-the-art approaches estimate the prompt cosmic ray, solar proton and the cosmic X-ray induced background with simulations using the Geant4 Monte Carlo tool-kit whose electromagnetic and hadronic physics models have extensively been verified with space and ground based experiments.

In contrast measurements to verify the radioactive decay implementation in Geant4 have been rare or have only been tested on a limited set of isotopes, which are not necessarily those used in satellite construction. We present first results of two experiments aimed to verify Geant4 activation and decay physics for materials significant for low background X-ray detectors in space.

EP 15: Sun I

Zeit: Donnerstag 17:00–17:45 Raum: AKM

EP 15.1 Do 17:00 AKM

Asymmetric flows in the solar corona — •Hardi Peter — Max-Planck-institut für Sonnensystemkroschung, 37191 Katlenburg-Lindau

The solar corona and the transition region from the chromosphere to the corona are highly dynamic regions. Previous EUV spectra from the transition regions using SUMER/SoHO showed asymmetric line profiles pointing to flows and/or wave broadening in structures intermixed along the line of sight. New observations of hot coronal plasma with EIS/Hinode now reveal the existence of such asymmetries also in hot active regions.

A new combined interpretation of the asymmetric EUV spectra from the transition region and hot corona will be given that will account for the feeding of plasma into the corona, either filling active region loop systems or supplying mass to the solar wind.

Evidence is presented that the actual mass supply to the corona and the find happens in the mid transition region, thus supporting previous studies of the connection of the chromospheric network to the origin of the solar wind.

EP 15.2 Do 17:15 AKM

Fields and flows around 3D reconnection — •Jörg Büchner[1], Jean-Carlo Santos[1], and Antonius Otto[2] — [1]Max-Planck-Institut für Sonnensystemforschung, Max-Planck-Str.2, 37191, Katlenburg-Lindau, Germany — [2]University of Alaska, Fairbanks

The three-dimensional (3D) structure and strength of reconnecion electric fields is not well understood, yet. Using the 3D numerical simulation model LINMOD3d we investigated the situation arising from a multipolar source of magnetic fluxes, typical for solar and stellar magnetic field configurations. We obtained the structure of and strength of fields and flows around the site of 3D reconnection and discuss their consequences for the conversion of magnetic energy into plasma flows and particle acceleration.

EP 15.3 Do 17:30 AKM

Plasmoid/plasmoid and plasmoid/loop-top interactions and particle acceleration in solar flares — •Miroslav Bárta[1,2], Jörg Büchner[1], and Marian Karlický[2] — [1]Max-Planck-Institut für Sonnensystemforschung, D-37191 Katlenburg-Lindau, Germany — [2]Astronomical Institute of Czech Academy of Science, CZ-25165 Ondřejov, Czech Republic

Using the Adaptive-Mesh-Refinement (AMR) MHD numerical model we simulated current-sheet fragmentation in solar flares. The AMR technique allowed us to study processes in the flare current sheet within a larger range of scales. In agreement with the concept of *cascading/fractal reconnection* (Shibata and Tanuma, Earth, Planets, and Space 53, 2001) we found the cascade of mutually interacting magnetic islands (plasmoids) formed on various spatial scales. We would like to demonstrate the importance of mutual plasmoid/plasmoid and plasmoid/loop-top interactions for energy release and particle acceleration in solar flares. We shall show some observable predictions of our simulations and their comparison with observations.

EP 16: Sun II

Zeit: Freitag 8:30–10:30 Raum: AKM

Hauptvortrag EP 16.1 Fr 8:30 AKM

Solar Dynamics Observatory (SDO) — •Markus Roth — Kiepenheuer-Institut für Sonnenphysik, Schöneckstr. 6, 79140 Freiburg, Germany

The Solar Dynamics Observatory (SDO) is the first mission to be launched for NASA's Living With a Star (LWS) Program. SDO is designed to help understanding the Sun's influence on Earth and Near-Earth space by studying the solar atmosphere on small spatial and temporal scales in many wavelengths simultaneously. The mission is planned to be launched in early 2010, and carries three primary instruments on board: the Helioseismic and Magnetic Imager (HMI), the Atmospheric Imaging Assembly (AIA), and the Extreme Ultraviolet Variability Experiment (EVE). The recorded data of 1-2 TB per day will be predominantly used for studying the origins of solar activity and how Space Weather is related to that activity. Measurements of the interior of the Sun, the Sun's magnetic field, the hot plasma of the solar corona, and the irradiance that creates the ionospheres of the planets will contribute to achieve the goals of the mission. In my presentation I will describe the science objectives of SDO, the instruments on board, expected results and their potential impact on future solar research.

EP 16.2 Fr 9:00 AKM

Kinetic Simulations of Type II Radio Burst Emission Processes — •Urs Ganse[1], Rami Vainio[2], and Felix Spanier[1] — [1]Lehrstuhl für Astronomie, Universität Würzburg — [2]Department of Physics, University of Helsinki

While the phenomenology of type II radio bursts is rather well studied, the detailed mechanism of the emission is not fully understood. Rather than trying to find the correct evolution of the CME using methods of fluid dynamics or combined fluid/kinetic methods, we are using a fully kinetic approach to model the movement of particles in a shock environment, therefore neglecting the large scale evolution of the shock, while correctly modelling the kinetic microphysics. The kinetic simulation itself is based on fully-relativistic Particle-in-Cell methods. This technique allows for observation of plasma wave excitation in the shock region and gives a deep insight into the mechanisms of emission and transformation of different wave modes. We were using Fourier- and Laplace-transform based analysis to identify wave modes and electromagnetic emission, especially focused on their evolution in time. Our simulations were able to produce phenomenological features similar to type II radio bursts, with a focus on production of waves through three-wave interaction. We present results of these simulations and compare them to previous models of radio burst modeling.

EP 16.3 Fr 9:15 AKM

Semi-Kinetic model for coronal loop — •Sofiane Bourouaine[1], Eckart Marsch[1], and Christian Vocks[2] — [1]Max-Planck-Institut für Sonnensystemforschung, 37191 Katlenburg-Lindau, Germany — [2]Astrophysikalisches Institut Potsdam, 14482 Potsdam, Germany

A multi-ion kinetic model for a coronal loop is presented, whereby ion heating in the magnetically confined plasma is achieved by absorption of ion-cyclotron waves. We assume that linear Alfvén/cyclotron waves penetrate the loop from its footpoint and directly heat the ions. Then due to electron-ion collisions the electrons can also be heated. Depending on the spatial variation of the mean magnetic field, the model is able to produce warm and hot model loops having features similar to the ones observed in extreme-ultraviolet and soft X-ray emissions in real coronal loops. Furthermore, it is found that a loop with high expansion factor is far from local thermal equilibrium (LTE) and shows remarkable temperature differences between electrons and ions. Also in such a case, the heavy ions (minor ions) are via resonant wave absorption heated more than the protons and helium ions (major background ions), whereby the cyclotron-resonance effect leads to a temperature anisotropy. However, if the flux tube cross section is nearly homogeneous, temperature isotropy of the ions is maintained in most parts of the loop, and the plasma is nearly in LTE.

EP 16.4 Fr 9:30 AKM

Solar Flare Particle-in-Cell Simulation Results — •Gisela Baumann[1,2], Aake Nordlund[1], Klaus Galsgaard[1], Troels Haugboelle[1], and Jacob Trier Frederiksen[1] — [1]Niels Bohr Institute, Copenhagen — [2]Ruhr-Universität Bochum

Solar flares are highly energetic phenomena on the Sun, releasing huge amounts of energy, carried amongst others by particles which are accelerated up to a few hundred km/s. In this talk the first results from a flare particle-in-cell (PIC) simulation, conducted to study the particle acceleration mechanism in solar flares, are presented. Two cases are compared: with and without collisions (Coulomb scattering) and likewise for gravity.

EP 16.5 Fr 9:45 AKM

Heating and acceleration of fast solar wind ions - a simulation study — •Yana Maneva[1], Eckart Marsch[1], and Jaime Araneda[2] — [1]Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany — [2]Departamento de Fisica, Universidad de Concepcion, Chile

We performed a set of one-dimensional hybrid simulations to investigate the preferential heating and acceleration of ions via the parametric decay of a large-amplitude Alfven-cyclotron wave. The electrons are treated as a charge- and current-neutralizing massless fluid, whereas a particle-in-cell method is used to follow the dynamics of the ion distribution functions under low-plasma-beta solar wind conditions. In the course of its evolution, the initial pump wave gets parametrically unstable and generates a broad spectrum of longitudinal ion-acoustic (IAW) and transverse ion-cyclotron waves (ICW), which destroy the coherent fluid motion of the ions and drive non-thermal processes. Trapping in, and consequent Landau damping of, the daughter IAWs lead to ion beam formation and generate or amplify differential streaming between the different ion species, whereas diffusion of the initial coherent ion bulk motion and pitch-angle scattering by the ICWs heat the ions in the perpendicular direction. Due to their lower mass densities and higher gyration rates, alpha particles and heavy ions get preferentially heated and accelerated. Depending on their initial drifts the core of the protons and alpha particles change their anisotropies, so that at low drifts the particles have larger temperatures in perpendicular direction, whereas for higher drifts strong parallel heating is observed.

EP 16.6 Fr 10:00 AKM

Coronal convection and solar wind sources — •Eckart Marsch and Werner Curdt — Max-Planck-Institut für Sonnensystemforschung

New results are presented regarding the relationships between the coronal magnetic field and the intensities and Doppler shifts of ultraviolet emission lines. We introduce the term coronal convection to indicate the observation that the plasma in the solar atmosphere is not static but everywhere moves. The blueshifts and redshifts seen in transition-region and coronal lines are interpreted as corresponding to upflows and downflows of plasma on open (funnels) and closed (loops) magnetic field lines, which tightly confine the low-beta coronal plasma and guide its flow. Strong evidence for this notion exists in the ubiquitous redshifts seen at both legs of loops on all scales, and in the lasting blueshifts occurring in magnetic funnels. We investigate which of these magnetic structures may supply mass and energy to the corona, and what the possible sources of the solar wind are on the scale of supergranular motion, which is the ultimate driver of coronal mass convection and solar wind outflow.

EP 16.7 Fr 10:15 AKM

Generation of energetic protons during solar flares — •Gottfried Mann — Astrophysikalisches Institut Potsdam, An der Sternwarte 16, D-14462 Potsdam, Germany

Huge flares are associated with the emission of gamma-ray lines indicating the generation of energetic protons during flares. In the framework of the reconnection scenario of solar flares, jets of hot plasma shoot away from the reconnection region due to the relaxation of the new magnetic field configuration. If the jet velocity exceeds the local Alfvén speed, a standing shock wave, so-called termination shock TS), can be established in the flare region. Such TS is able to accelerate both electrons and protons via the shock-drift acceleration (SDA). A fully relativistic study of SDA at the TS confirms that this mechanism is able to accelerate protons up to few tens of GeV under flaring conditions in the solar corona. This model implies different locations for electron and proton acceleration at the TS. That can explain the separation of the hard X- and gamma-ray sources as really seen by RHESSI imaging observations.